SERVICE MANUAL

70F Clamps

Manual Number 229603

cascade® corporation

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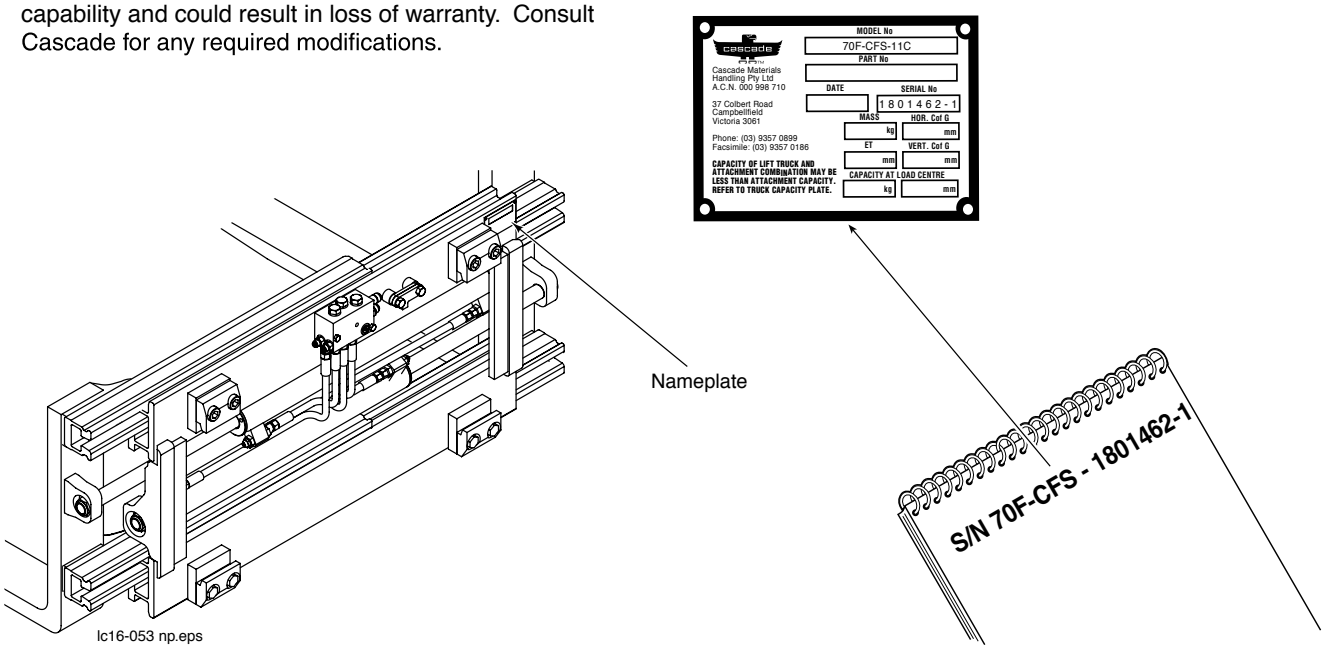
1.1 Introduction

This manual provides instructions for installing a Cascade 70F Clamps. Follow the suggested installation proceddures for best results. If you have any questions or need more informatiuon, contact your nearest Cascade Service Department, (see back cover)

Read the **WARNING** Statements placed throughout this manual to emphasize safety during clamp installation.

IMPORTANT: Field alterations impair performance or capability and could result in loss of warranty. Consult Cascade for any required modifications.



1.2 Special Instruction Definitions

CAUTION
A statement preceded by CAUTION is information that should be acted upon to prevent Machine Damage.

WARNING: A statement preceded by WARNING is information that should be acted upon to prevent bodily injury. A WARNING is always inside a ruled box.

IMPORTANT
A statement preceded by IMPORTANT is information that possesses special significance.

NOTE
A statement preceded by NOTE is information that is handy to know and may make your job easier.

2.1 Truck System Requirements

WARNING: Rated capacity of the truck/attachment combination is a responsibility of the original truck manufacturer and may be less than that shown on the attachment nameplate. Consult the truck nameplate.

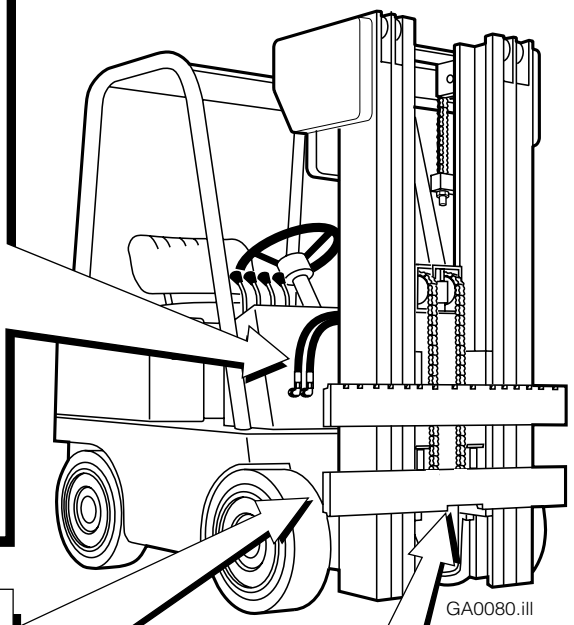
Truck Relief Valve Setting:
2300 psi (160 bar), maximum.
2000 psi (140 bar), recommended.

Truck Flow Volume ①

Capacity	Min②	Recommended	Max ③
3200 Lbs (1600 Kg)	**5.2 GPM** (19 L/min)	**10 GPM** (28 L/min)	**13 GPM** (49 L/min)
5500 Lbs (2500 Kg)	**5.2 GPM** (19 L/min)	**10 GPM** (28 L/min)	**13 GPM** (49 L/min)
7000 Lbs (3200 Kg)	**7.8 GPM** (29 L/min)	**14 GPM** (52 L/min)	**17 GPM** (63 L/min)

① Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. Mil-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic oil is not recommended. Contact cascade if fire resistant hydraulic oil must be used.
② Flow less than minimum will result in equal arm movement
③ Low greater than maximum can result in excessive heating, reduce systen performance and short hydraulic system life.

box01



Carriage
Clean carriage bars and inspect for damaged notches

box03.eps

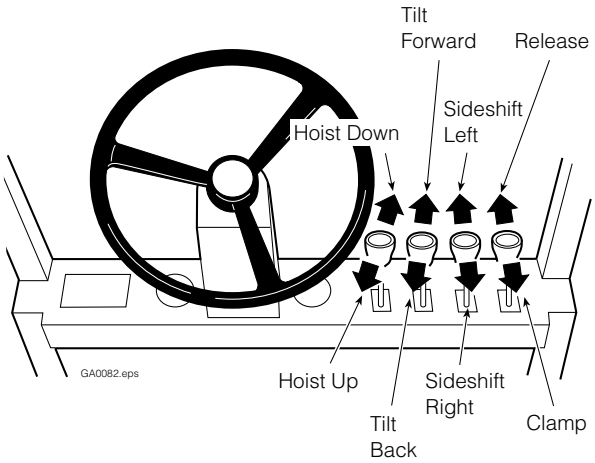
Carriage Mount Dimension (A) ITA (ISO)

	Minimum	Maximum
Class II	14.96 in (380.0mm)	15.00 in (381.0 mm)
Class III	18.68 in (474.5mm)	18.74 in (476.0 mm)
Class IV	14.96 in (595.5mm)	23.50 in (597.0 mm)

box02.eps

Auxiliary Valve Functions

Check for compliance with ANSI standards:

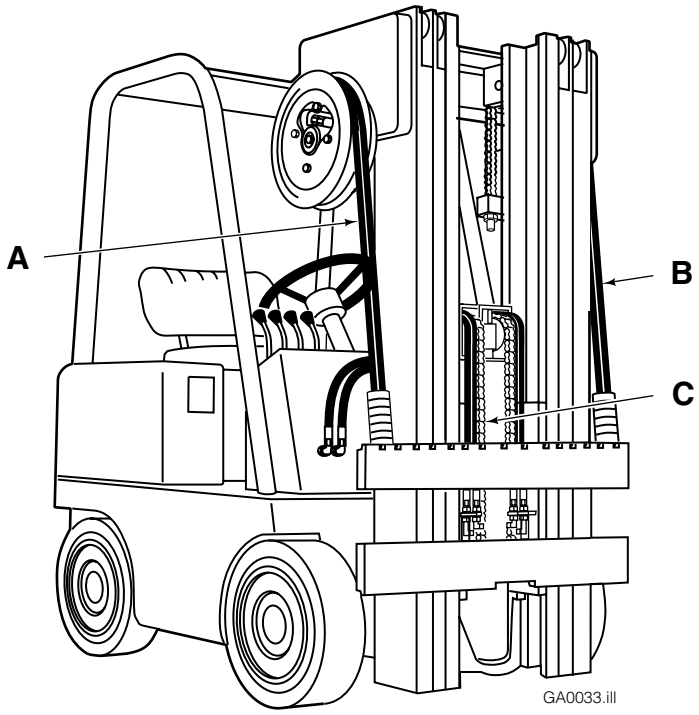


① Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. Mil-0-5606 or MIL-0-2104B. Use of synthetic or aqueous base hydraulic oil is not recommended. Contact cascade if fire resistant hydraulic oil must be used.
② Flow less than minimum will result in equal arm movement
③ Low greater than maximum can result in excessive heating, reduce systen performance and short hydraulic system life.

2.2 Recommended Hydraulic Supply Options

70F Clamps provide the best performance with one of the hydraulic supply arrangements shown below. Refer to Cascade *Hose and Cable Reel Selection* Guide, Part No. 212119, to select the correct hose reel for the mast and truck. The hose and fitting requirements are:

- All hoses for **clamp** functions should be at least No. 8 hose with 13/32 in. (10mm) minimum I.D.
- All hoses for **sideshift** functions should be at least No. 6 hose with 9/32 in. (7mm) minimum I.D.
- All **fittings** should have a minimum internal diameter of 9/32in. (7mm).



Non-Sideshifting

A or B

RH or TH YHINLINE™ 2 post hose reel group.

OR

C Mast single internal hose reeving group.

Sideshifting

A or B

RH or TH YHINLINE™ 2 post hose reel group.

OR

C Mast single internal hose reeving group.

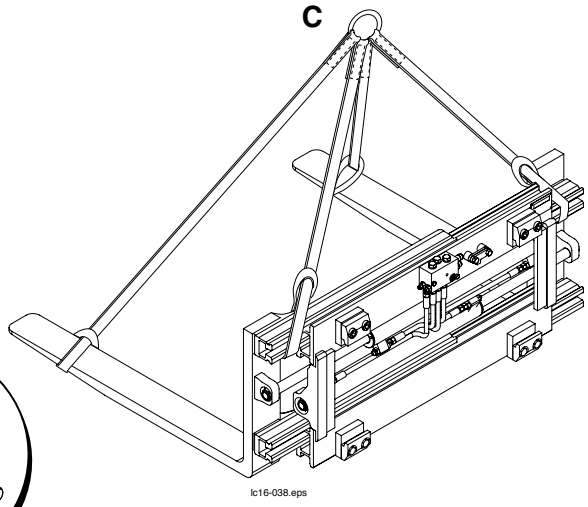
2.3 Installation Procedure

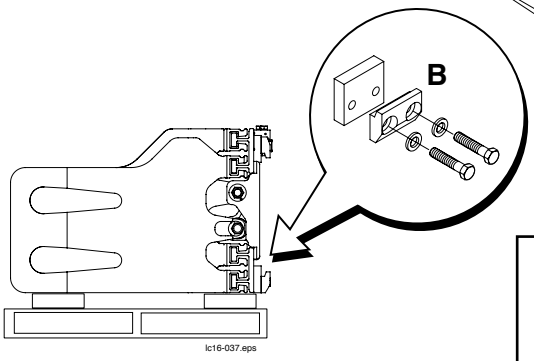
1 **Prepare Attachment**

A Remove banding.

B Remove bolt-on lower mounting hooks (if equipped).

C For clamp which are not self upported by arms. Extend the arms and attach slings as shown. Set the clamp vertical.



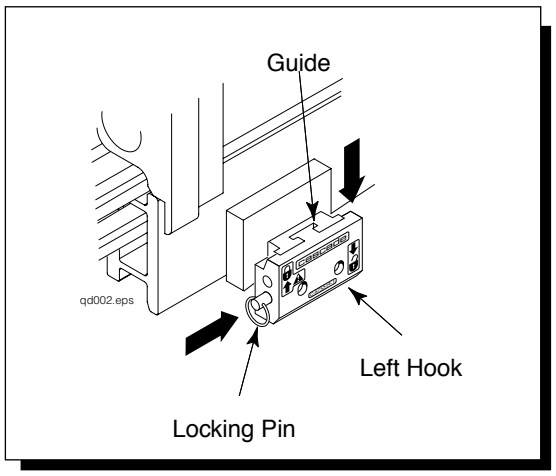


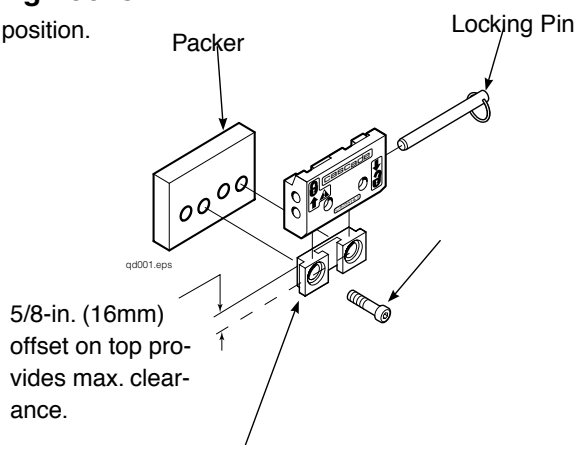
WARNING: Make sure your overhead hoist has a rated capacity of at least 4000 lbs. (1800 kg).

2 **Unlock Quick-Change lower mounting hooks**

A Remove pin and drop hooks into unlocked position.

B Re-install pin in lower hole.





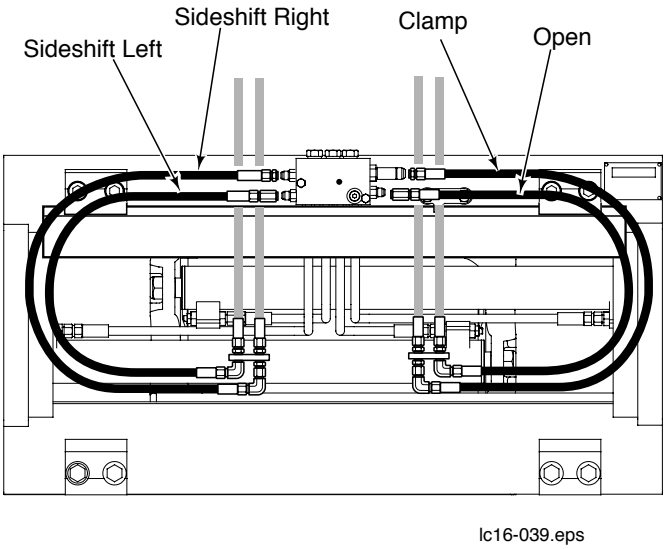
NOTE: Guides can be reversed to reduce hook-to-carriage clearance (See lower hook installation, Step 6).

3 Prepare hoses

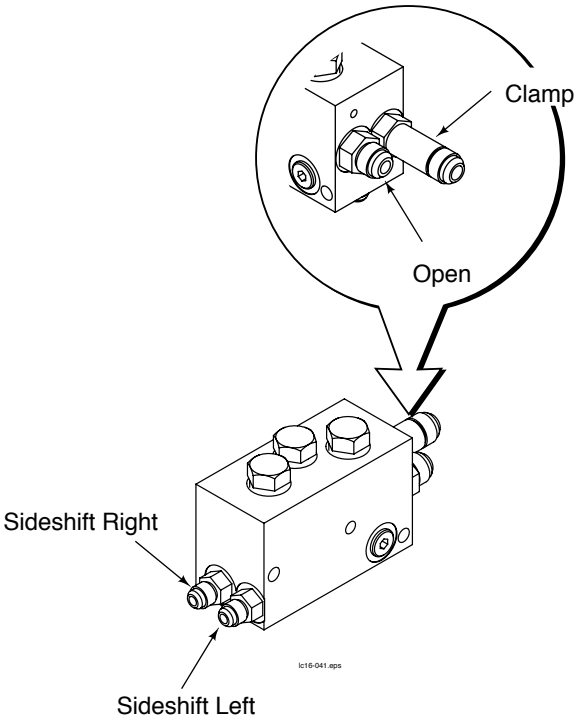
A Determine hose lengths required for hydraulic supply configuration of truck.

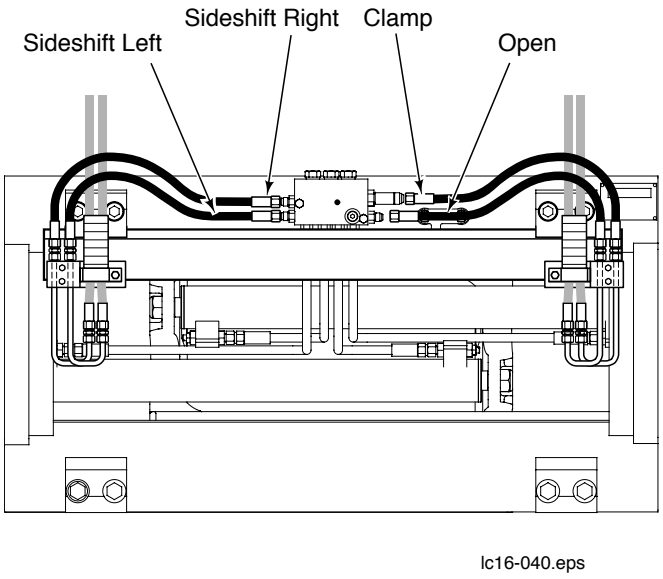
B Cur hoses to length, install end fittings or quick-disconnect kits.

WARNING: Do not remove the fitting from the valve clamp (CL) port.
For No. 6 hose connection, use a 6-8 reducer.



Sideshifting - Double Internal Hose Reeving





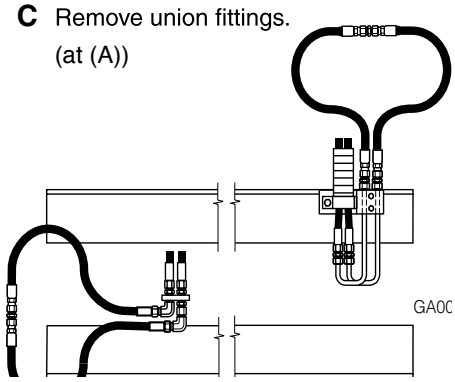
Sideshifting with Hose Reel

4 Flush hydraulic supply hoses

A Install hoses using union fittings.

B Operate auxiliary valves for 30 sec. in both directions.

C Remove union fittings. (at (A))



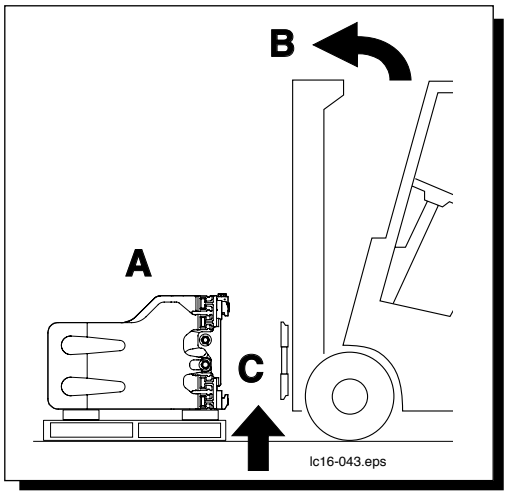
5 Mount Clamp on truck carriage

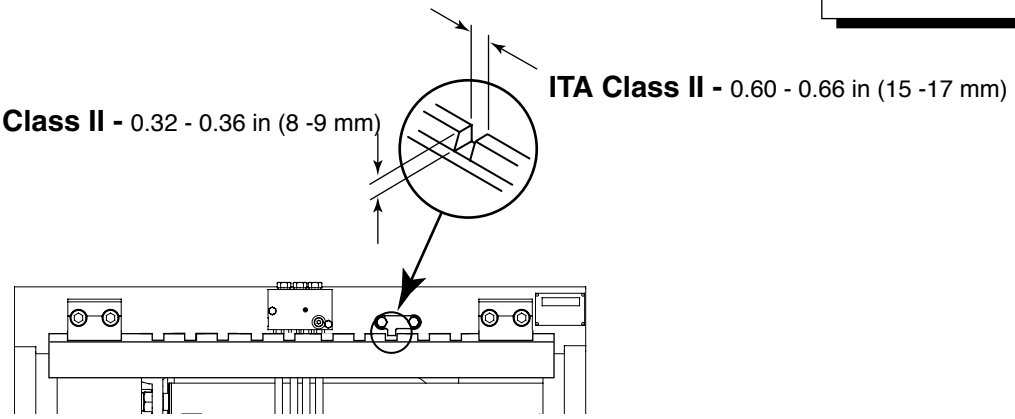
A Centre the lift truck behind the attachment.

B Tilt the mast forward.

C Engage the mounting hook tab with the closest upper carriage bar notch and raise the truck carriage into position behind the attachment,

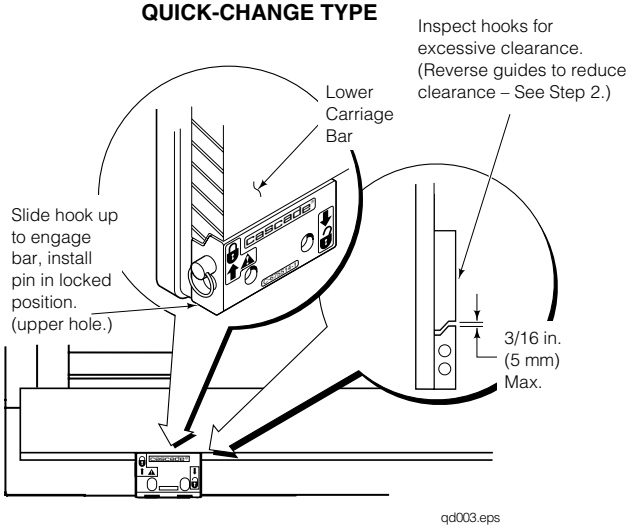
D Lift attachment 2in.(5cm) off the pallet.



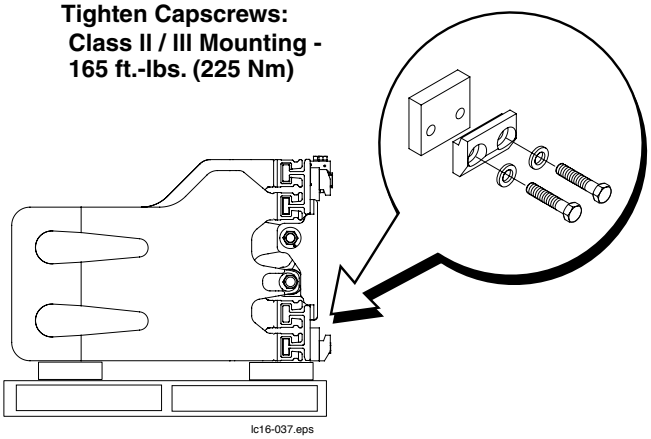


6 Install and engage lower hooks

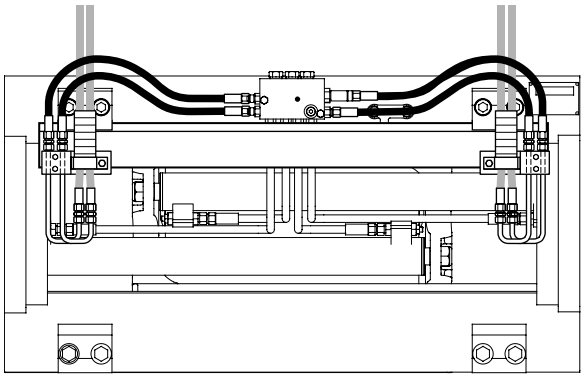
QUICK-CHANGE TYPE


Inspect hooks for excessive clearance. (Reverse guides to reduce clearance – See Step 2.)
Lower Carriage Bar
Slide hook up to engage bar, install pin in locked position. (upper hole.)
3/16 in. (5 mm) Max.
qd003.eps

Tighten Capscrews: Class II / III Mounting - 165 ft.-lbs. (225 Nm)



7 Connect Hoses as shown in Step 3



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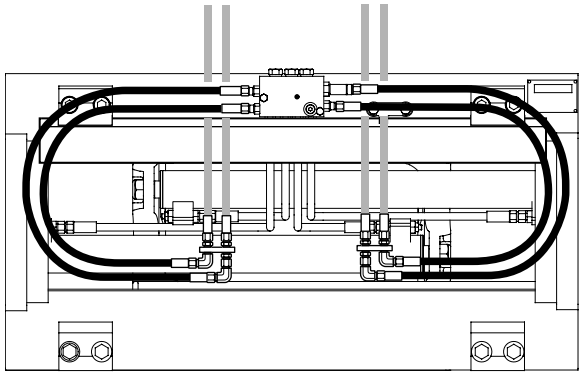

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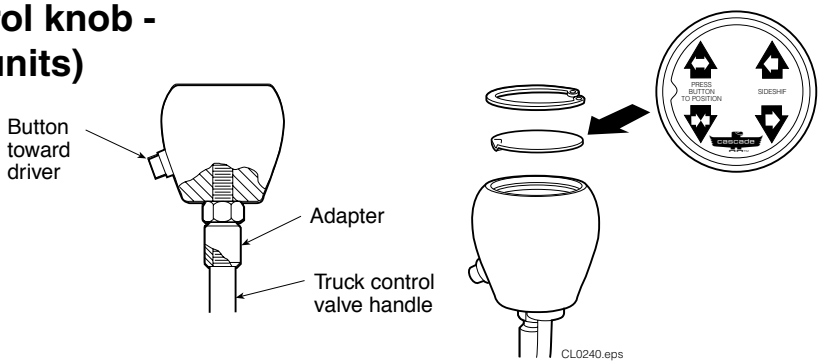
8 Install solenoid control knob - (Solenoid equipped units)



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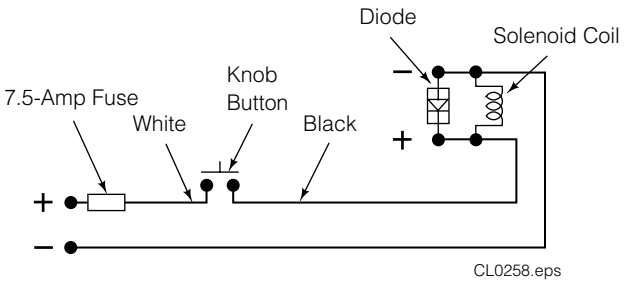
9 Install wiring - (Solenoid equipped units)



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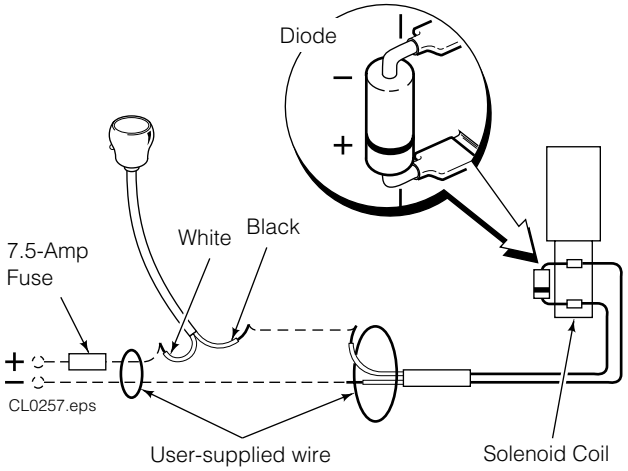


CL0257.eps

10 Prior to Operation

NOTE: Some 70F clamps utilize a regenerative hydraulic circuit in the arm opening mode. In this case the arms will open at a faster speed than when closing. Check for equal arm travel. If the travel is unequal, the restrictor cartridges can be adjusted as follows:

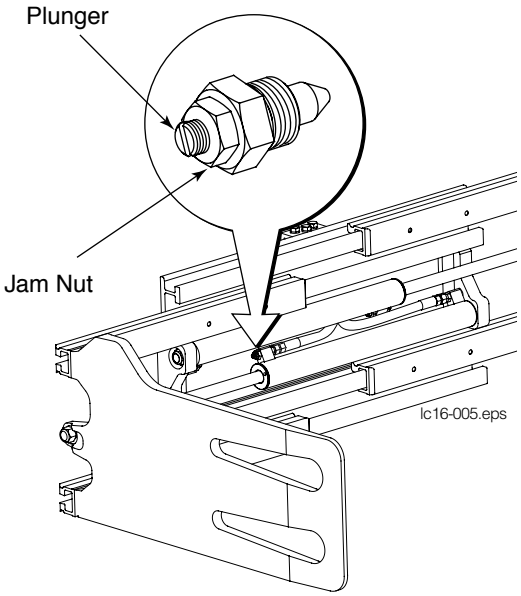
A. Loosen the jam nuts on the restrictor cartridges. Screw in the plungers until they bottom out. Then screw out each plunger three full turns.

B. Activate the arms to the fully open position.

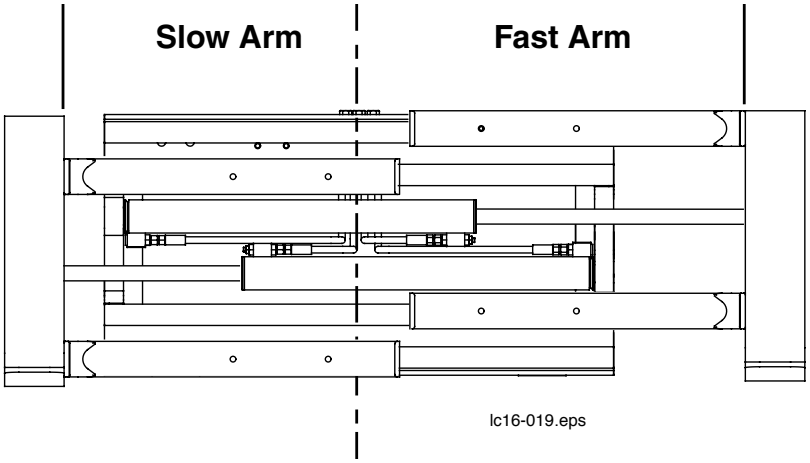
C. Activate the arms to close until one arm bottoms out. Measure the amount of stroke remaining in the opposite arm.

D. If the unequal closing movement exceeds 50 mm (2 in)., screw the plunger in 1/2 turn on the cylinder that bottomed first.

E. Repeat steps (b) through (d) until unequal closing movement is less than 2 in.



Arm Speed Adjustment



Screw out - anti-clockwise
increase flow - speeds up arm

Screw in - clockwise
decrease flow-slows arm down

11 Clamp Cycle function

- With no load, cycle each Clamp function several times.
- Check for operation in accordance with ITA (ISO) standards.
- Lift a maximum load, check for smooth arm movement.
- Check for leaks at fittings, valve, manifold and cylinders.

WARNING: Make sure all personnel are clear of the Clamp during testing.

SIDESHIFTING RIGHT

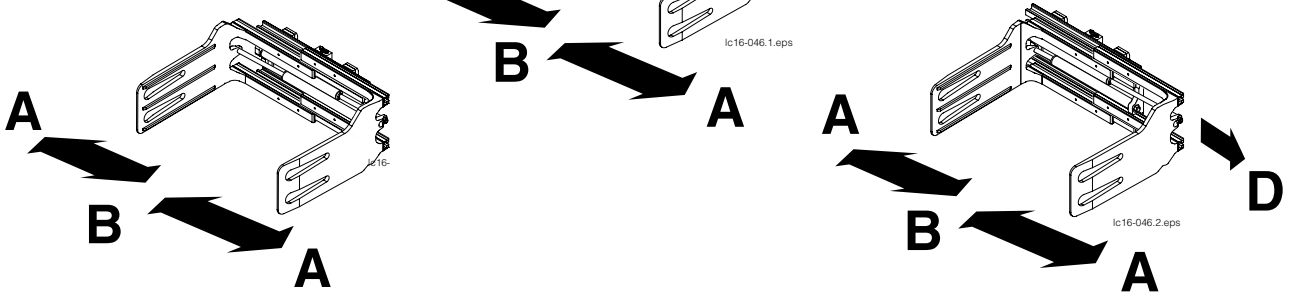
A Release Arms
B Clamp Arms
C Sideshift Right
D Not Used

NON-SIDESHIFTING

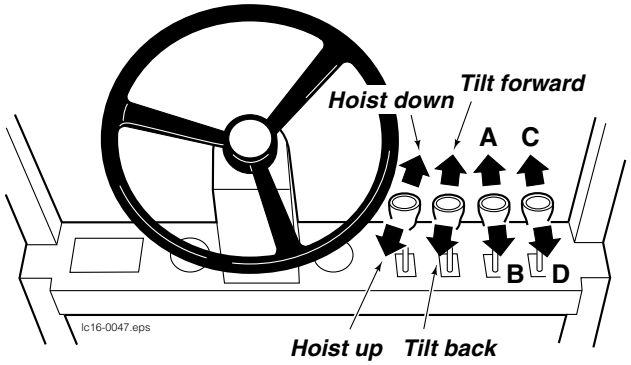
A Release Arms
B Clamp Arms
C Not Used
D Not Used

SIDESHIFTING LEFT

A Release Arms
B Clamp Arms
C Not Used
D Sideshift Left



Auxiliary Valve Functions

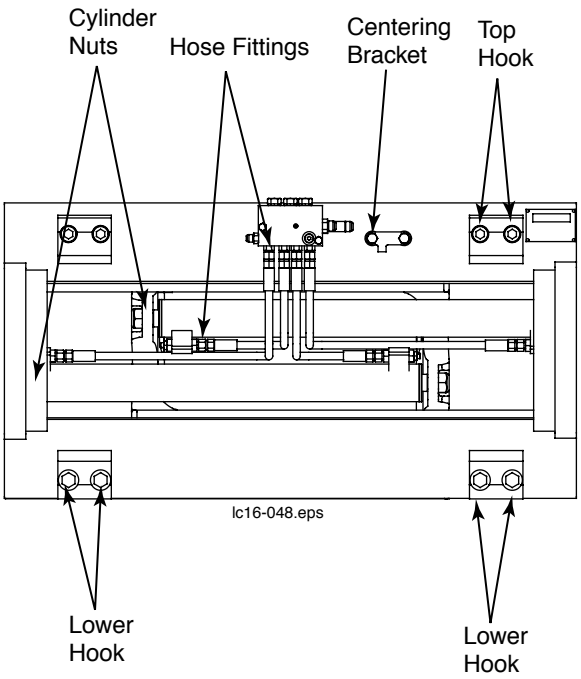


3.1 100-Hour Maintenance

Every time the lift truck is serviced or every 100 hours of truck operation, whichever comes first, complete the following maintenance procedures:

- Inspect the cylinder anchor nuts for correct hold.
- Apply wheel bearing grease to the spherical portion of the cylinder anchor nuts.
- Arm bearing life can be extended with periodic inspection. Inspect 'T' section for any damage or sharp edges caused through impacting or foreign matter caught in the 'C' sections.
- Check for worn, damaged or leaking hoses.
- Check arm speed and uniform arm travel - clamps fitted with regenerative valves should operate to the following speeds if clamp is plumbed as per the chart in section 2.2 .OPEN. 5 seconds. CLOSED . 6-7 seconds. NOTE: these values may vary depending on frame width of clamp.

WARNING: After completing any service procedure, always test the Clamp through five complete cycles. First test the Clamp empty, then test with a load to make sure the Clamp operates correctly before returning it to the job.



3.2 500-Hour Maintenance

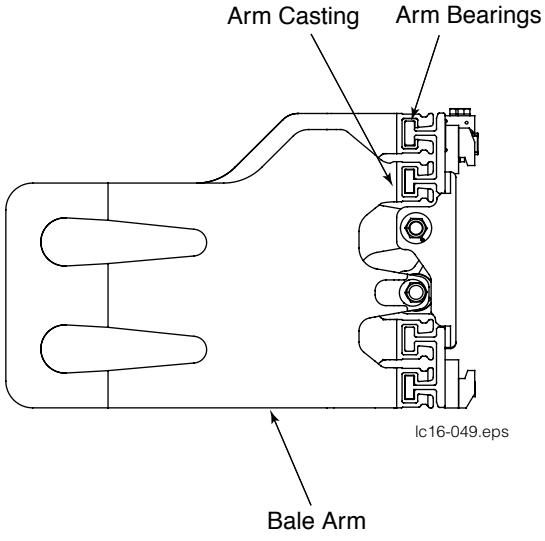
After each 500 hours of lift truck operation, in addition to the 100-hour maintenance procedures, perform the following:

- Tighten the top and lower hook capscrews. Use the torque specifications shown in Section 6.1-4
- Check for wear and tear to bolt on or weld on accessories (ie) bale arm, forks - repair or replace as required

3.3 1000-Hour Maintenance

In addition to the 100-hour and 500-hour maintenance procedures, perform the following.

- Inspect the arm bearings. If the bearings are worn in any area to a thickness less than .040 in. (1 mm), they must be replaced. See Section 5.2



3.4 2000-Hour Maintenance

After each 2000 hours of lift truck operation, in addition to the 100-hour, 500-hour, and 1000-hour maintenance procedures, perform the following procedures.

- Replace all arm bearings. See Section 5.2
- Tighten the frame/mounting plate capscrews. Use the torque specification shown in Section 6.1-4.

4.1 General Procedures

WARNING: Before servicing any hydraulic & component, relieve pressure in the system. Turn the truck off, and open the truck auxiliary valves several times in both directions.

After completing any service procedure, always test the function through several cycles. First test the attachment empty to bleed air trapped in the system to the truck system. Then test the attachment with a load to be sure it operates correctly before returning it to the job.

Stay clear of the load while testing. Do not raise the load more than 3 in. (7cm) off floor while testing.

4.1-1 Truck Systems Requirements

- The lift truck must supply sufficient hydraulic pressure to handle the heaviest load. PRESSURE MUST NOT EXCEED 2300 PSI (160 BAR).
- Hydraulic flow should fall within the volume range shown in the table.
- The truck hydraulic system must supply hydraulic oil to the attachment that meets the specification shown in the table.

4.1-2 Tools Required (Metric)

In addition to a normal selection of hand tools, you will need:

- A flow meter capable of measuring hydraulic flow to 20 GPM (75 L/min.). The parts shown are included in Cascade Flow Meter Kit Part No. 671477.
- A pressure gauge capable of measuring pressure to 2500 psi (175 bar). The parts shown are included in Cascade Pressure Gauge Kit Part No. 671212.
- Assorted fittings and a No. 6 hose, as shown, to adapt the gauge and flow meter to the components being tested.

Hydraulic Specifications	1600 Kg
Pressure - Maximum	2300 psi (160 bar)
Recommended	2000 psi (140 bar)
Flow - Minium ①	5.2 GPM (19L/min)
Recommended	10 GPM (38L/min)
Maximum ②	13 GPM (49L/min)
Supply Hose and Fitting Size Minimum Orifice Size	No.6 (Sideshift) 9/32in. (7mm) No. 8 (Clamp) 13/22 in. (10mm)

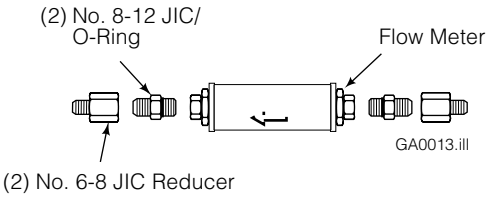
① Flow less than minimum will result in unequal arm move ment.

② Flow greater than maximum can result in excessive heating, reduced system performance and short hydraulic system life.

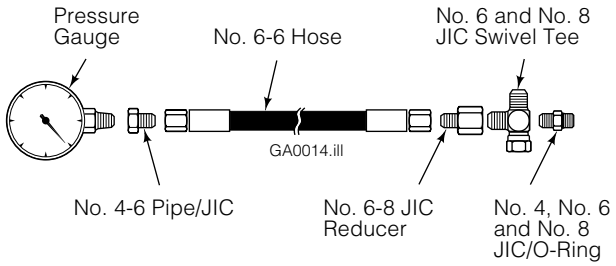
Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mill Spec. MIL-0-5606 or MIL-0-2104B.

Use of synthetic or aqueous base hydraulic oil is not recommended. Contact Cascade if fire resistant hydraulic oil must be used.

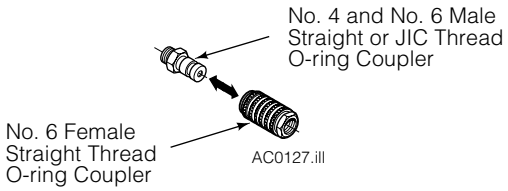
Flow Meter Kit 671477



Pressure Gauge Kit 671212



Diagnostic Quick-Coupler



4.1.3 Get All The facts Before You begin Working On The Clamp

It is important that you gather all the facts regarding the problem before you begin service procedures. The best way is to talk with the operator. Ask for a complete description of the malfunction. The following guidelines will help you decide where to be in your troubleshooting procedures.

Clamp Circuit

- Clamp drops load after it has been picked up.
- Clamp will not carry load up to its rated capacity.
- Clamp arms have uneven travel.
- Clamp arms travel slowly.
- Clamp arms will not move.

To correct these problems, see Sections 4.3-1 and 4.3-2.

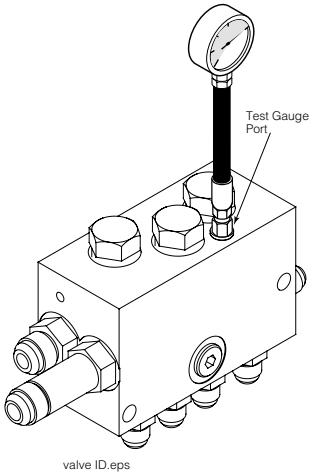
Sideshift Circuit

- Clamp drops the load when sideshifting.
- Clamp sideshifts left and right at different speeds.

To correct these problems, see Sections 4.4-1 and 4.4-2

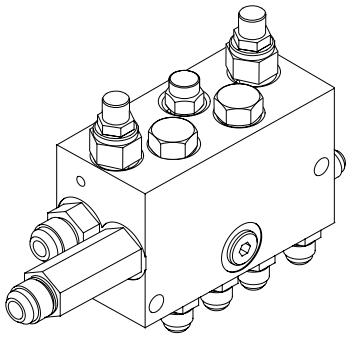
4.1.4 Valve Identification & Test Port Location

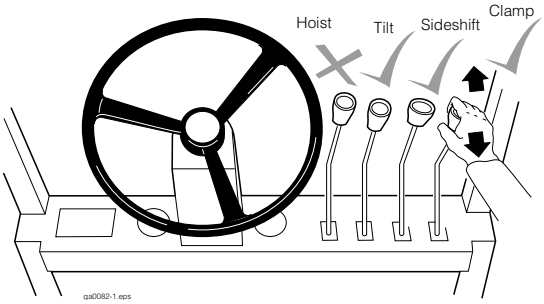
Non Sideshifting - 1600 Kg Clamps



Sideshifting - 2500-3200 Kg Clamps

VIEW FROM REAR OF CLAMP

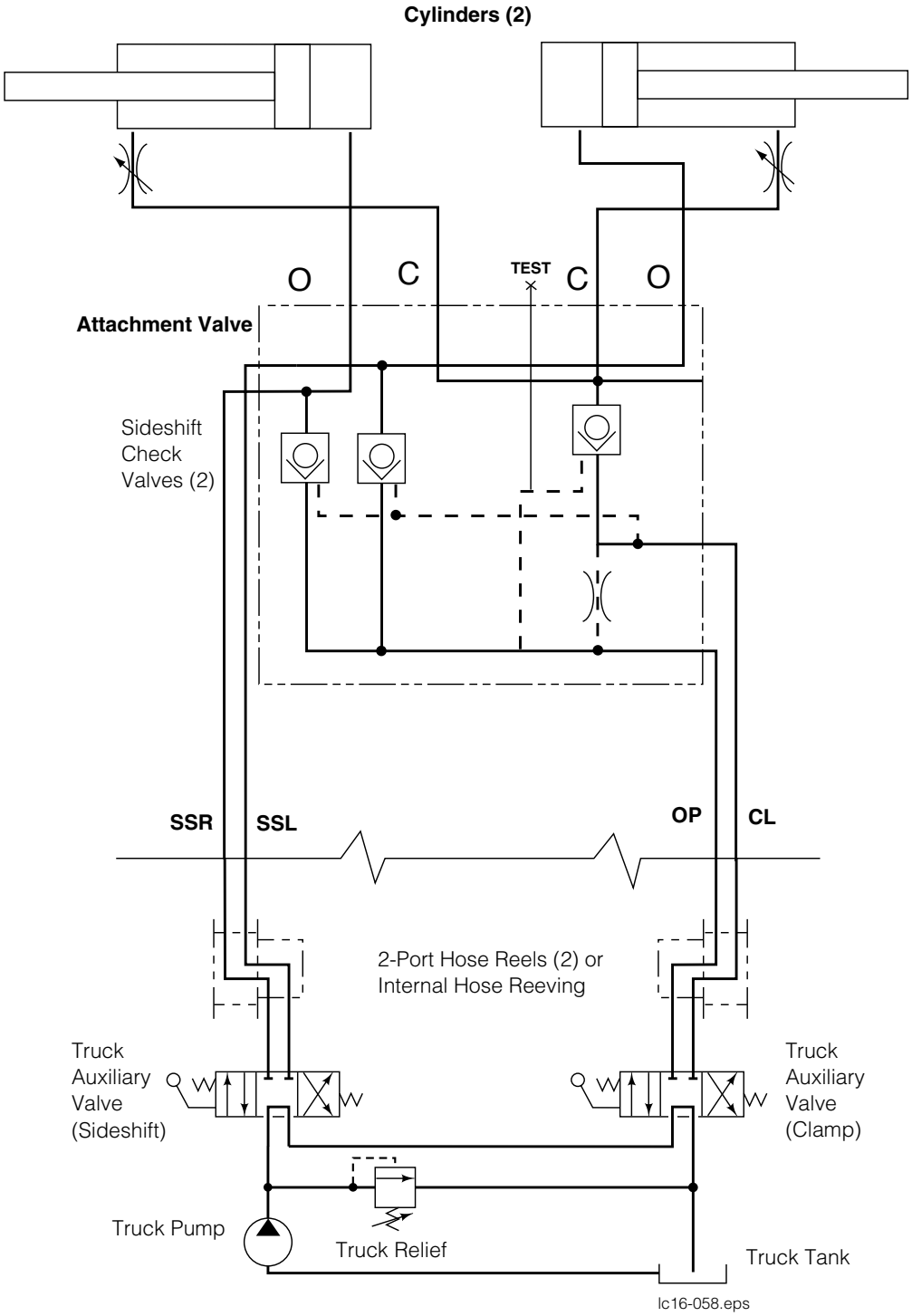




Before removing any hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

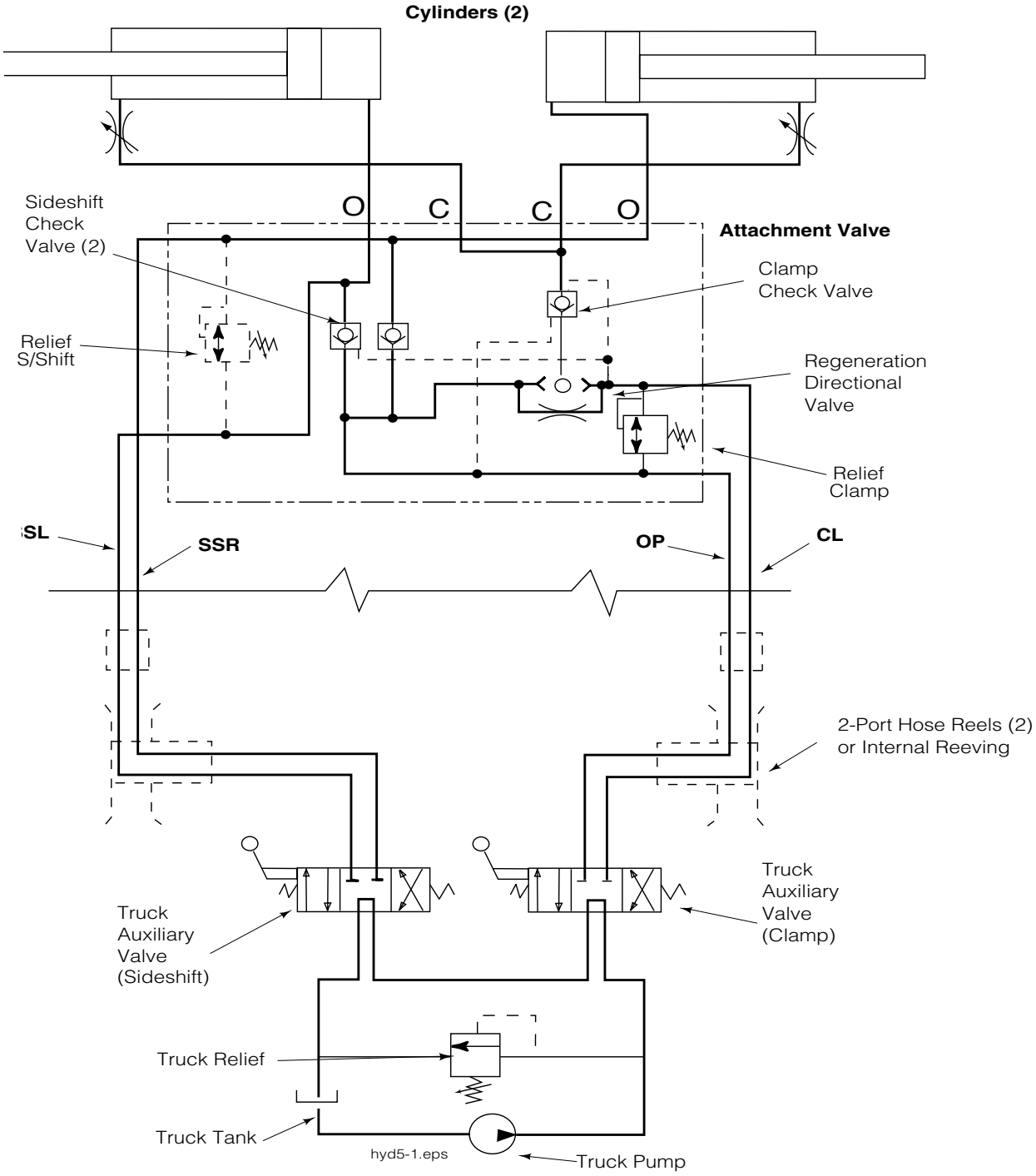
4.2 Plumbing

4.2-1 Hydraulic Circuit Sideshifting Clamps - Non Regeneration - Rear Mount

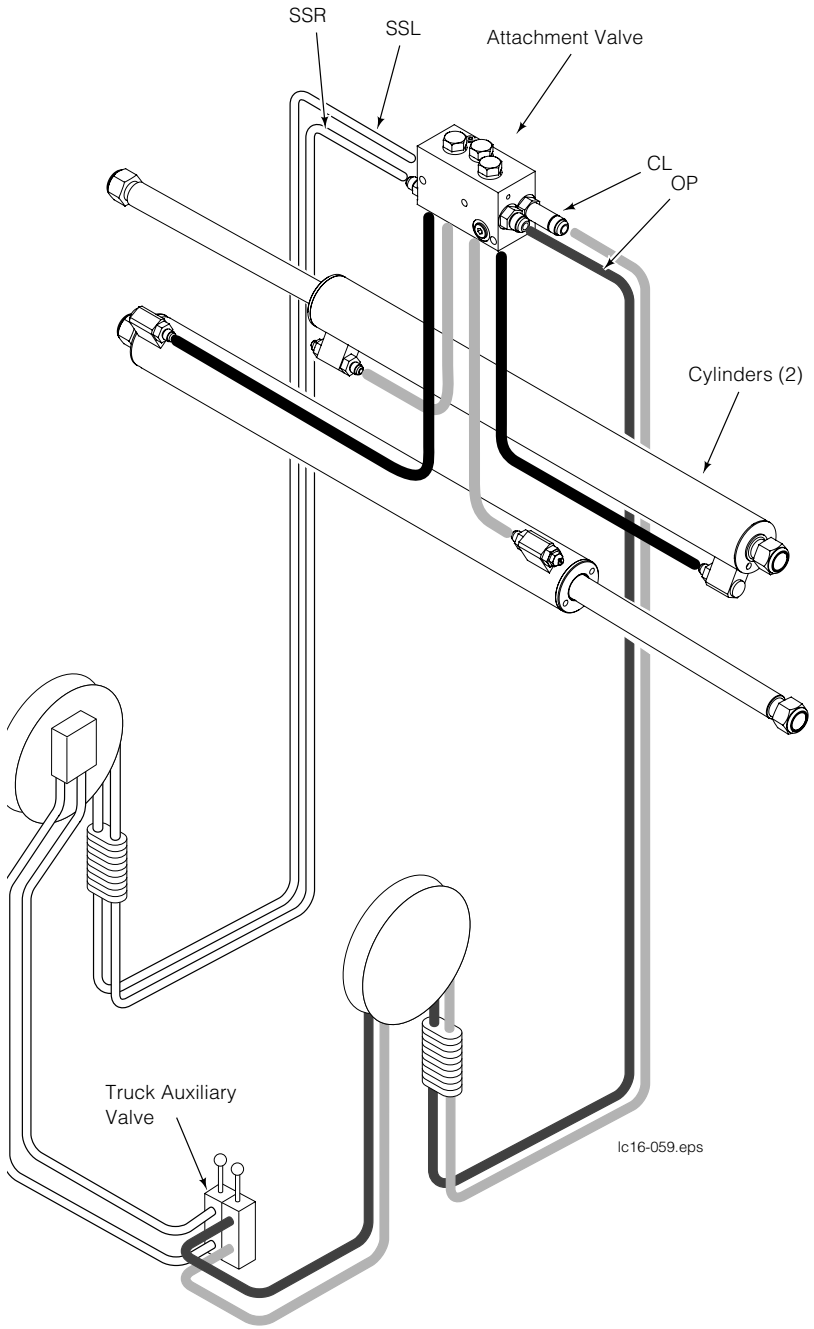


4.3 Plumbing

4.3-1 Hydraulic Circuit Sideshifting Clamps - With Regeneration - Rear Mount



4.2-1 Sideshifting Clamps - Hosing Diagram



	CLAMP ARMS	RELEASE ARMS
Pressure:		
Return:		

4.3 Clamp Function

- There are five potential problems that could affect the CLAMP function:
- Incorrect load handling. Refer to the Operator's Guide for suggested procedures.
- Incorrect hydraulic pressure or flow from the lift truck.
- External leaks.
- Defective solenoid coil or valve (if equipped).
- Worn/defective cartridge valves or cylinder seals.

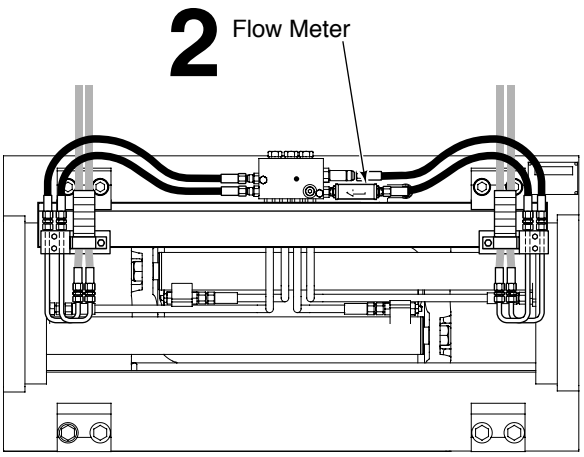
WARNING: Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

4.3-1 Supply Circuit Test

1 Check the truck pressure at the carriage hose terminal. The pressure must be within 100 psi (7 bar) of specified truck pressure. TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (160 Bar), See section 6.1 for recommended operating pressure.

2 Check the flow volume at the hose terminal. See Section 6.1 for the recommended flow volumes.

3 Start the truck. Close the arms fully. Holding the lever in the CLAMP position for a few seconds. Release the lever and check for external leaks at fittings, hoses and valve.



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4.3-2 Clamp Circuit Test

1 Press the solenoid button (if equipped) and listen for a 'click' at the solenoid valve. If no sound is heard check the fuse, wiring and coil (see section 4.5).

IMPORTANT: Solenoid-operated valves must be plumbed so that the solenoid is energised during the CLAMP/ RELEASE function.

2 Open and close the arms fully.

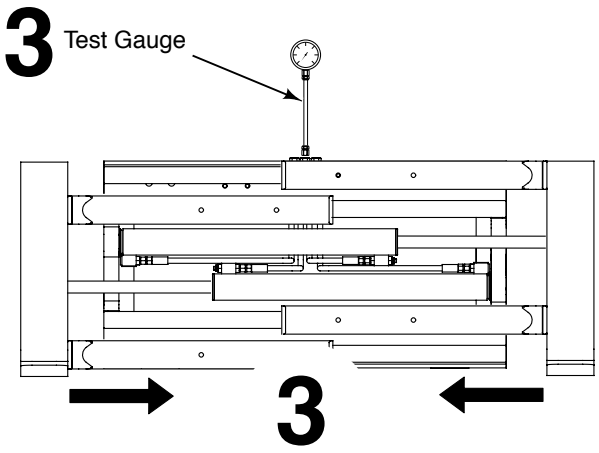
3 Position the arms mid-stroke. Turn the truck off and connect a 3500 psi (240 bar) pressure gauge to the test port on the main valve.

4 Start the truck and close the arms fully, holding the lever in the clamp position for a few seconds.

5 Release the lever and watch the pressure gauge.

- If the pressure drop is less than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute. Then the problem is not hydraulic. (See section 4.1-3)
- If the pressure drop is more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute. Then the clamp check valve cartridge may be faulty. Replace the cartridge.

6 Close the rams fully and hold the lever in the CLAMP position for a few seconds. If the pressure still drops as before, the cylinder seals are faulty and must be replaced.



4.4 Sideshift Function

- There are five potential problems that could affect the SIDESHIFT function:
- Incorrect load handling. Refer to the Operator's Guide for suggested procedures.
- Incorrect hydraulic pressure or flow from the lift truck.
- External leaks.
- Defective solenoid coil or valve (if equipped).
- Worn/defective cartridge valves or cylinder seals.

4.4-1 Supply Circuit Test

1 Check the truck pressure at the carriage hose terminal. The pressure must be within 100 psi (7 bar) of specified truck pressure. TRUCK PRESSURE MUST NOT EXCEED 2300 PSI (160 Bar), See section 6.1 for recommended operating pressure.

2 Check the flow volume at the hose terminal. See Section 6.1 for the recommended flow volumes.

3 Start the truck. Close the arms fully. Holding the lever in the SIDESHIFT position for a few seconds. Release the lever and check for external leaks at fittings, hoses and valve.

4.4-2 Sideshift Circuit Test

1 Press the solenoid button (if equipped) and listen for a 'click' at the solenoid valve. If no sound is heard check the fuse, wiring and coil (see section 4.5).

IMPORTANT: Solenoid-operated valves must be plumbed so that the solenoid is energised during the CLAMP/ RELEASE (not sideshift) function.

2 Open and close the arms fully.

3 Position the arms mid-stroke. Turn the truck off and connect a 3500 psi (240 bar) pressure gauge to the test port on the main valve or install a gauge and 'T' fitting into line as per diagram if NO TEST PORT is available.

4 Start the truck,clamp and raise a load clear of the floor. Sideshift **Left** and hold the lever for a few seconds.

5 Release the lever and watch the pressure gauge.

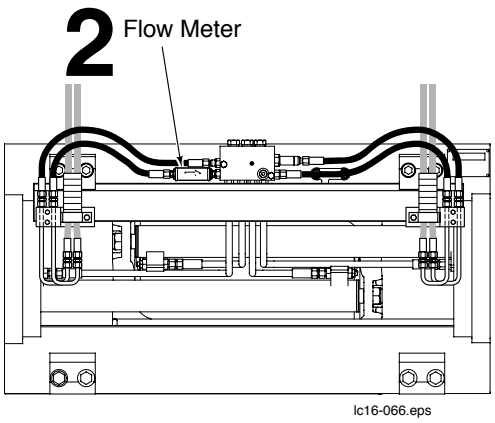
If the pressure drop i**s more** than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute. Then the sideshift Left check valve cartridge may be faulty. Replace the cartridge.

If the pressure drop **is less**. Sideshift **Right** and hold the lever for a few seconds.

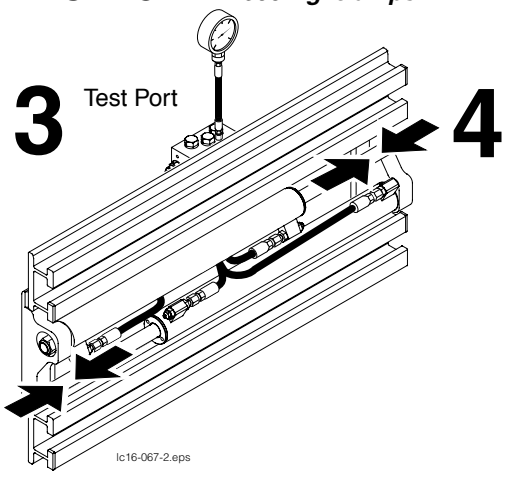
6 Release the lever and watch the pressure gauge.

- If the pressure drop i**s more** than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute. Then the Sideshift Right check valve cartridge may be faulty. Replace the cartridge.
- If the pressure drop **is less**, the problem is not hydraulic (see Section 4.1-3)

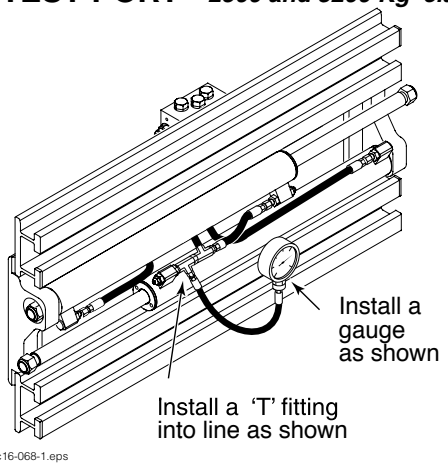
WARNING: Before installing the pressure gauge, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.



WITH - TEST PORT - ***1600 Kg clamps***



NO - TEST PORT - ***2500 and 3200 Kg clamps***



WARNING: Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliry control valves several times in both directions.

4.5 Cylinders

4.5-1 Cylinder Pressure Test -WITH TEST PORT

1 With all the lines connected to the cylinders.

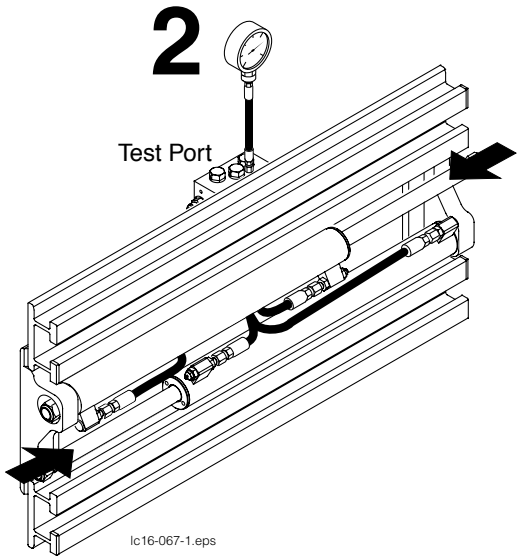
2 Position the arms mid-stroke. Turn the truck off and connect a 3500 psi (240 bar) pressure gauge to the test port on the main valve or install a gauge and 'T' fitting into line as per diagram if NO TEST PORT is available.

3 Start the truck. Hold the clamp control handle in the clamp position for a few seconds.

4 Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the sideshift left cartridge is faulty and requires service.
- If the pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, the second cylinder is faulty.

It is recommended to perform a similar test for the second cylinder before servicing.



WITH TEST PORT - ***1600 Kg clamps***

4.5-2 Cylinder Pressure Test - NO TEST PORT

1 Connect one of the hydraulic lines to its cylinder. The other line must remain plugged.

2 Insert gauge into line as shown.

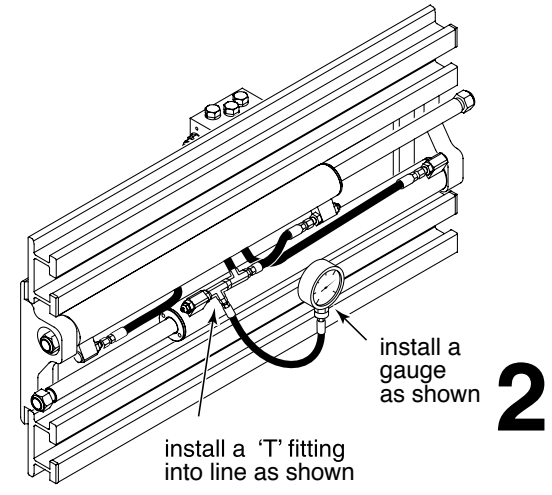
3 Start the truck. Hold the clamp control handle in the clamp position for a few seconds.

4 Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the sideshift left cartridge is faulty and requires service.
- If the pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25psi (2 bar) per minute, the second cylinder is faulty.

It is recommended to perform a similar test for the second cylinder before servicing.

IMPORTANT: Before removing pressure gauge, with truck turned off, momentarily actuate clamp open circuit. This will relieve pressure trapped by check valves in clamp circuit.



NO TEST PORT - ***2500 and 3200 Kg clamps***

4.6 Check Valve

4.6-1 Check Valve Test - WITH TEST PORT

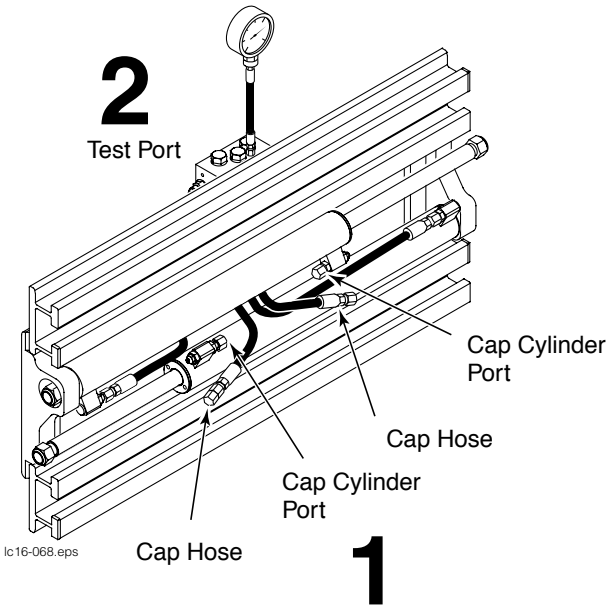
1 Disconnect the hydraulic lines at the rod end of both cylinders. Cap the ports and plug the lines.

2 Position the arms mid-stroke. Turn the truck off and connect a 3500 psi (240 bar) pressure gauge to the test port on the main valve or install a gauge and 'T' fitting into line as per diagram if NO TEST PORT is available.

3 Start the truck. Hold the clamp control handle in the clamp position for a few seconds.

4 Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the check valve is faulty and requires service.
- If the pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, one or both cylinders require service. Proceed with the troubleshooting check list to isolate the faulty component.



WITH TEST PORT - ***1600 Kg clamps***

4.6-2 Check Valve Test - NO TEST PORT

1 Disconnect the hydraulic lines at the rod end of both cylinders. Cap the ports and plug the lines.

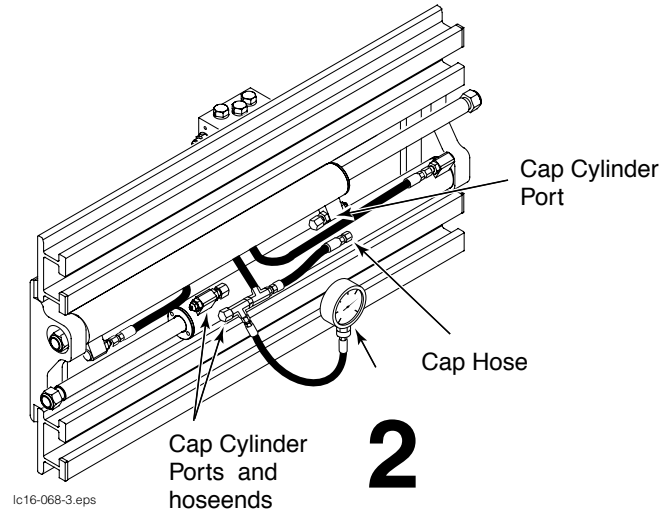
2 Insert guage into line as shown.

3 Start the truck. Hold the clamp control handle in the clamp position for a few seconds.

4 Return the handle to neutral. Watch the gauge pressure reading.

- If the pressure drops more than 150 psi (10 bar) initially, and additional drop exceeds 25 psi (2 bar) per minute, the check valve is faulty and requires service.
- If the pressure does not drop more than 150 psi (10 bar) initially, and additional drop does not exceed 25 psi (2 bar) per minute, one or both cylinders require service. Proceed with the troubleshooting check list to isolate the faulty component.

IMPORTANT: Before removing pressure gauge, with truck turned off,momentarily actuate clamp open circuit. This will relieve pressure trapped by check valves in clamp



NO TEST PORT - ***2500 and 3200 Kg clamps***

4.7 Electrical Circuit

(Solenoid-equipped Clamps)

Use the electrical schematic and diagram shown and follow the steps below:

1 Check the control knob circuit fuse. Replace if necessary.

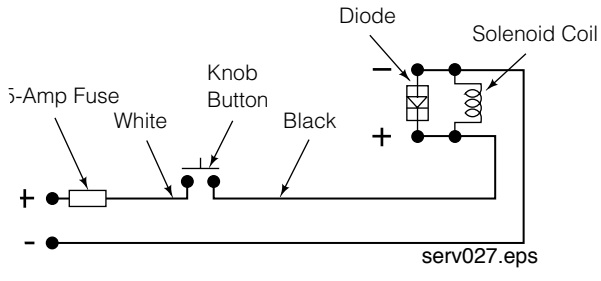
2 Check for loose electrical connections at the truck ignition switch, control knob button, solenoid coil terminals and diode.

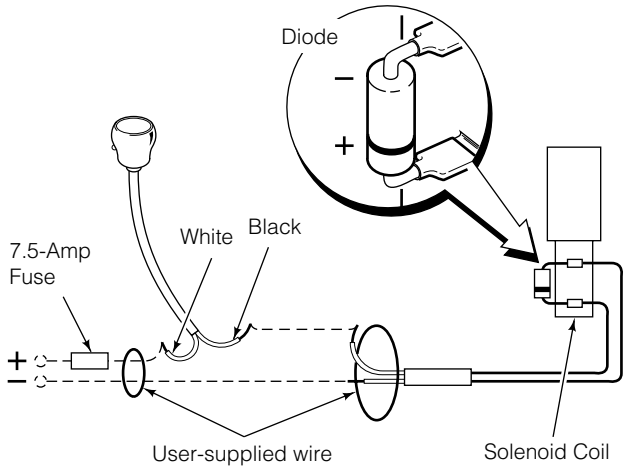
3 Remove the diode from the solenoid coil terminale. Test with an ohmmeter for high resistance in one direction and no resistance in the other direction. If there is no resistance in both directions, replace the diode.
NOTE: When replacing the diode, the banded (+) end must be connected to the coil and wiring as shown.

4 Disconnect the electrical leads from the solenoid coil terminals. Use a voltmeter to determine if voltage is present at the electrical leads when the button is depressed.
- If there is no current to the solenoid, troubleshoot the electrical circuit for shorts.
- If there is current to the solenoid, test for coil continuity.

5 Test for coil continuity by placing an ohmmeter test lead on each solenoid coil terminal (ohmmeter on Rx1scale).
- If there is an ohmmeter reading, the coil is good.
- If the coil is good, but the solenoid does not 'click' when the control knob button is depressed, the solenoid cartridge may be jammed. Refer to Section 5.6.
- If there is no ohmmeter reading, the coil is defective and should be replaced. Refer to Section 5.6.

Install wiring -
(Solenoid equipped units)





5.1 Clamp Removal

1 Extend the arms to outside the width of the frame.

> **WARNING:** Before removing any hoses, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valve(s) several times in both directions.

2 Disconnect and plug the hoses to the attachment. Tag the hoses for reassembly.

3 Disconnect the Lower Hooks.

Bolt On Type - Remove the lower mounting hooks. For reassembly, tighten the capscrews to a torque of:

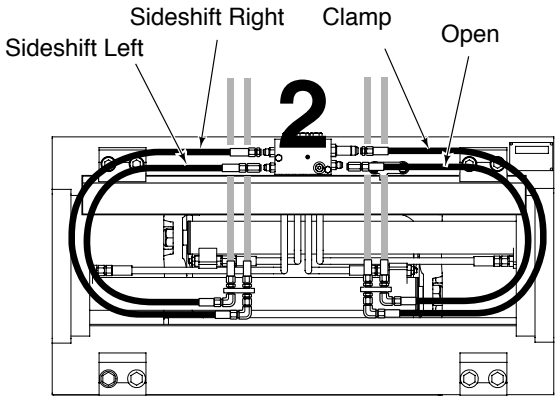
Class II Mounting -105-115 ft.-lbs. (140-155 N m)

Quick Change Type - Pull out the retaining pin, slide the hook down and reinstall the pin in the lower hole. For reassembly, slide the hook up and install the pin in the top hole.

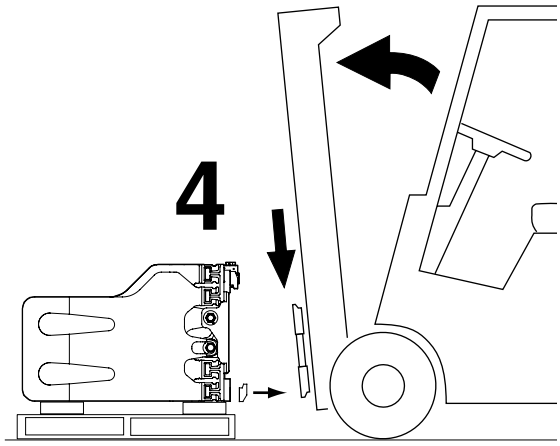
4 Lower the clamp onto a pallet. Tilt the mast forward and lower the carriage to disengage the upper hooks.

NOTE: Attachments with load arms other than forks Do not require additional stabilizing weight.

5 For installation, reverse the above procedures, or consult the Installation Instructions, refer to section **Section 2.**



As seen from drivers seat



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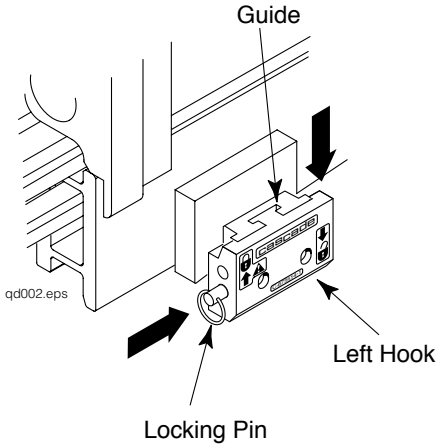
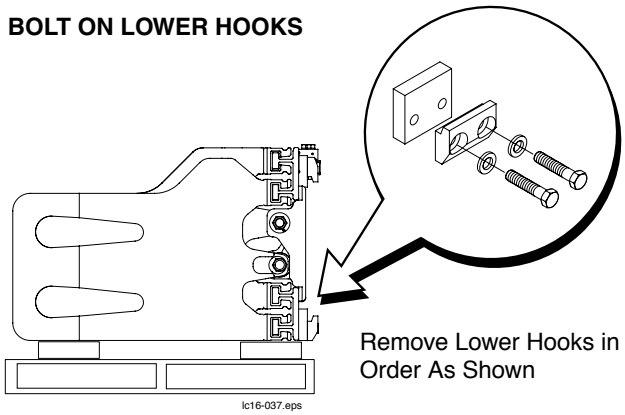
QUICK CHANGE LOWER HOOKS



BOLT ON LOWER HOOKS



5.2 Arms

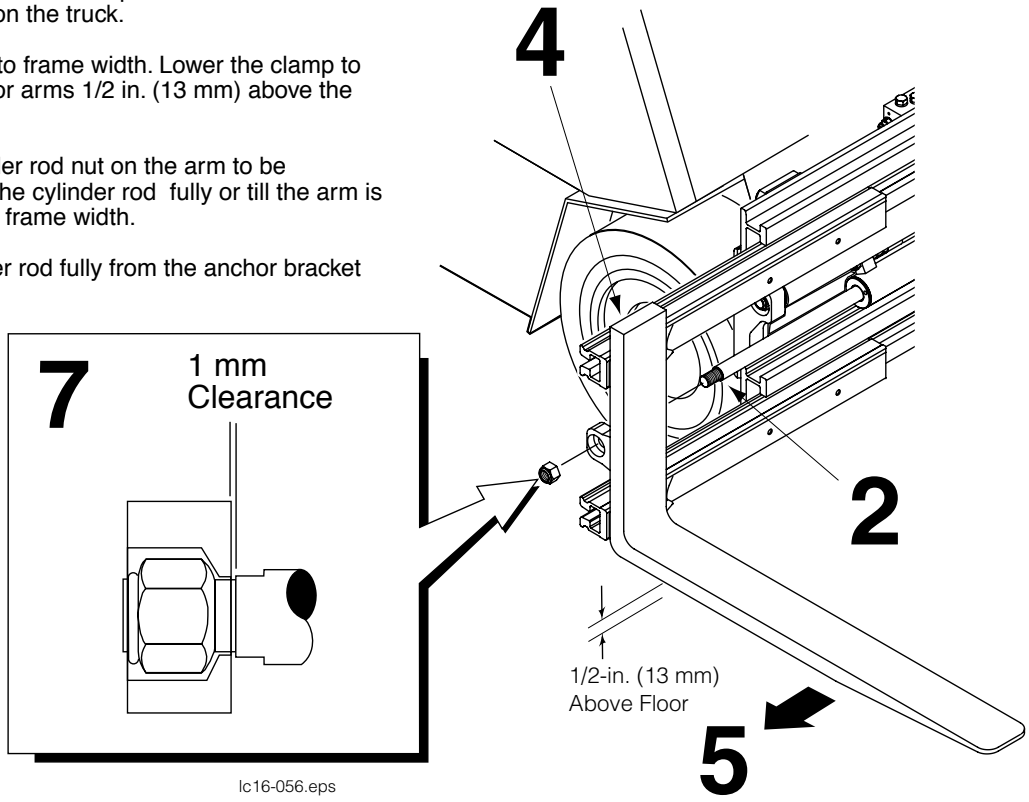
5.2-1 Arm Assembly Removal and Installation

The following procedures can be performed with the attachment mounted on the truck.

1 Position the arms to frame width. Lower the clamp to position the forks or arms 1/2 in. (13 mm) above the floor.

2 Remove the cylinder rod nut on the arm to be removed, Extend the cylinder rod fully or till the arm is clearly outside the frame width.

3 Retract the cylinder rod fully from the anchor bracket



4 Attach an overhead hoist and chain to the arm assembly. Position the chain clear of the arm bearing surfaces. CAUTION: Use a second chain to stabilise the arm if required.

> **WARNING:** Make sure your overhead hoist has a rated lifting capacity of at least 2000 lbs. (900 kg).

5 Slide the arm assembly out of the frame.

6 For reassemble, reverse the above procedures.

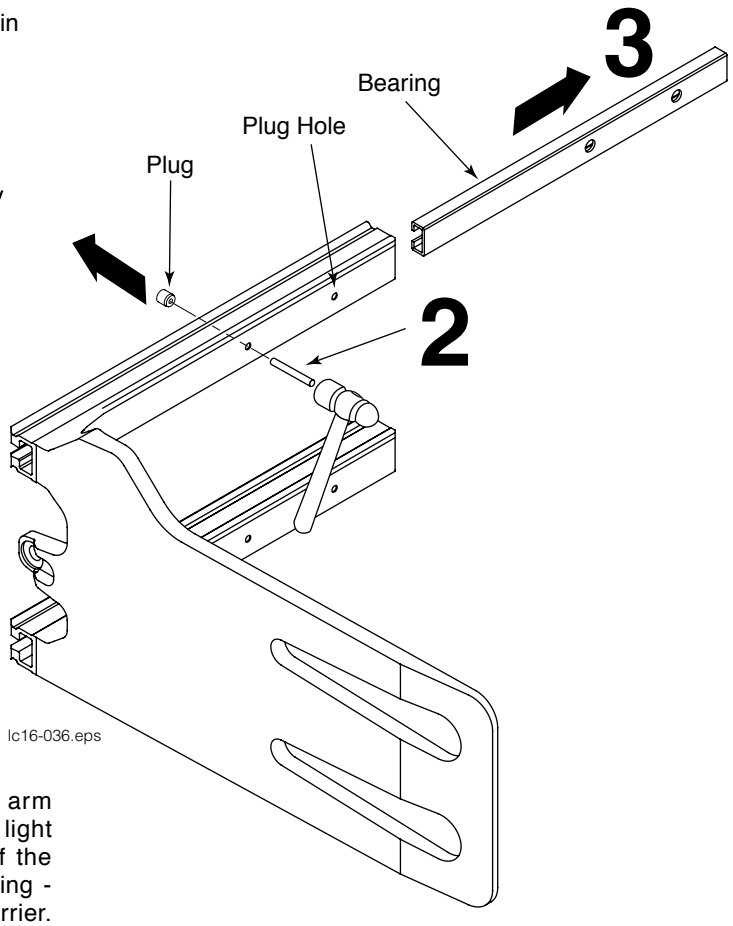
7 Tighten the nylock nut up fully then back off the nut 1/4 turn (1 mm clearance). Prevent the rod turning by using a wrench on the (rod end) wrench flats.

5.2-4 Arm Bearing Removal and Installation

1 Remove the arm assemblies from the attachment as described in Section (see page 20)

2 Using a 10 mm diameter punch. Insert the punch in the holes located in the front of the arm carriers, drive the bearing retainer plugs out of the arm.

3 Using a piece of flat stock 50 x 20 mm - Drive the one piece bearing out of the arm carrier untill sufficient material is exposed to remove it by hand or with a pair of multi grips.



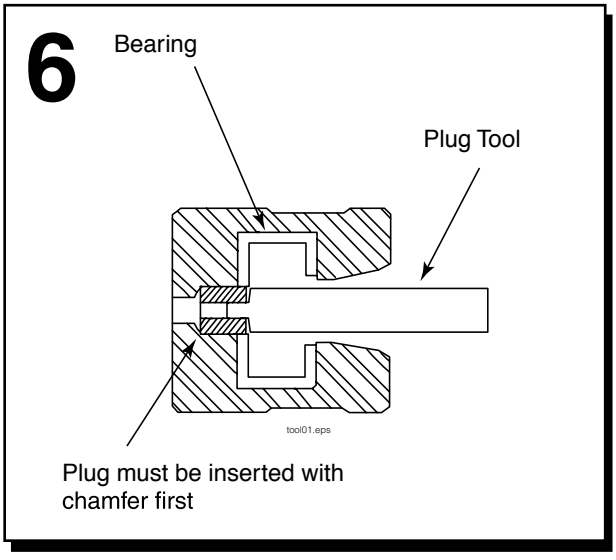
4 To replace bearing - Clean the inside of the arm carrier of any contaminants and spay with a light coating of lubricant STP. Note the position of the offset bearing retaining holes in the new bearing - these must align with the holes in the arm carrier.

5 Insert the leading edge of the new bearing into the arm carrier and drive the bearing into place using a piece of board to protect the bearing end.

6 Insert the bearing retainer plugs as shown with the plug insertion tool. The plug face should be set 1 mm below the inside face of the bearing.

NOTE: If plugs are damaged or worn replace as plugs must be tight in the arm carrier and engage the bearing by at least 4.5 mm.

7 For reassemble, reverse the above procedure, except for the following special instructions for cylinder anchor nuts.



5.3 Valves

5.3-1 Check Valve Service (Non Regenerative 1600 kg Clamps)

IMPORTANT: Service the Check Valve in a clean area.

1 Remove the valve from the clamp.

2 Remove the special fitting.

3 Remove the cartridges from the valve body.

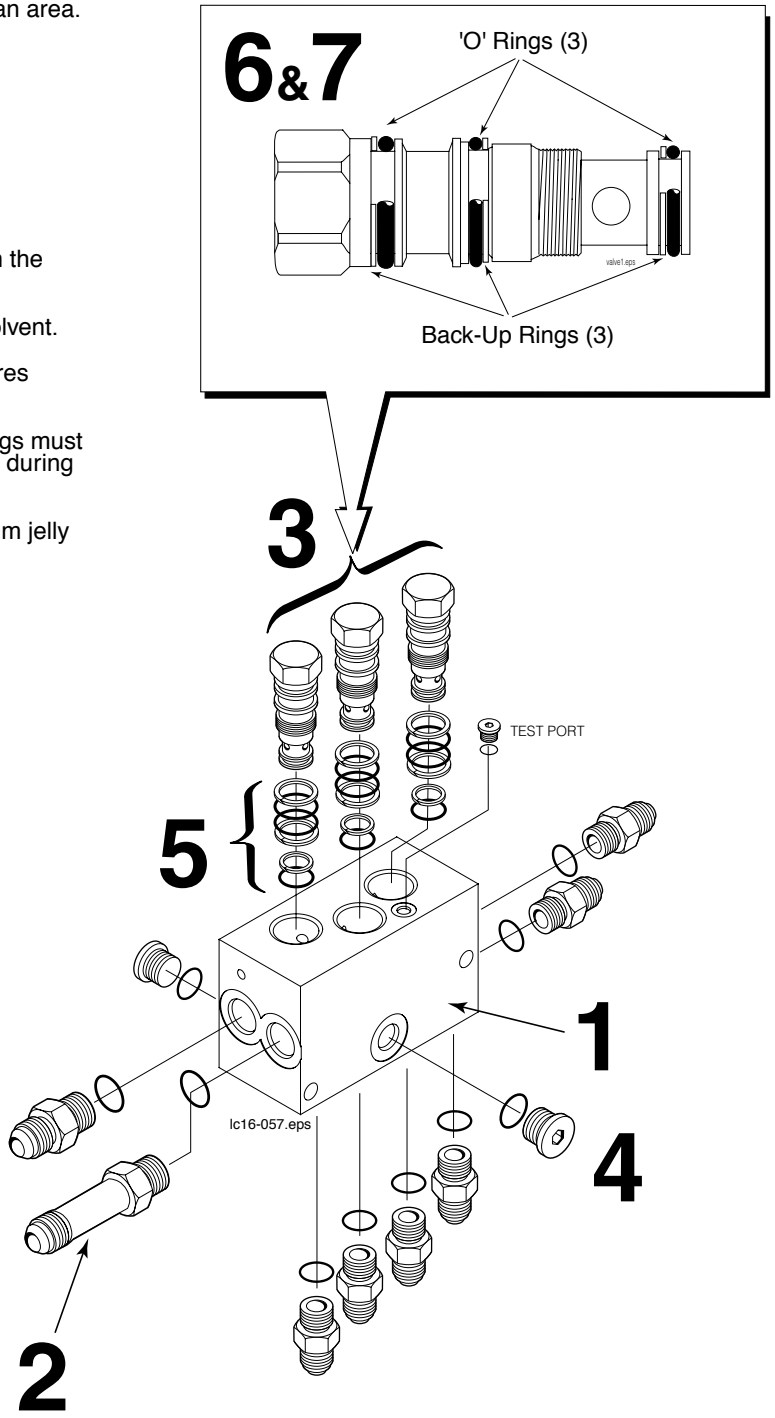
4 Remove the remaining plugs and fittings.

5 Remove the O-rings and back-up rings from the cartridges.

6 Clean all parts with kerosene or cleaning solvent.

7 For reassembly, reverse the above procedures except as follows:

- The cartridge valve back-up rings and O-rings must be installed as shown to avoid seal damage during reassembly.
- Lubricate cartridges and seals with petroleum jelly prior to reassembly.

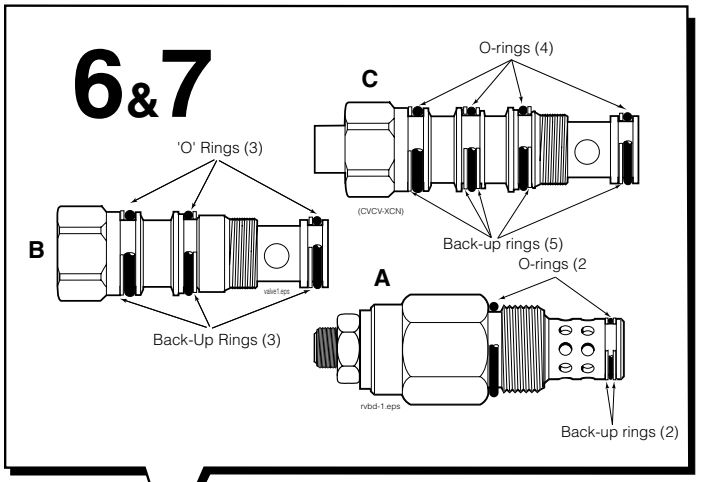


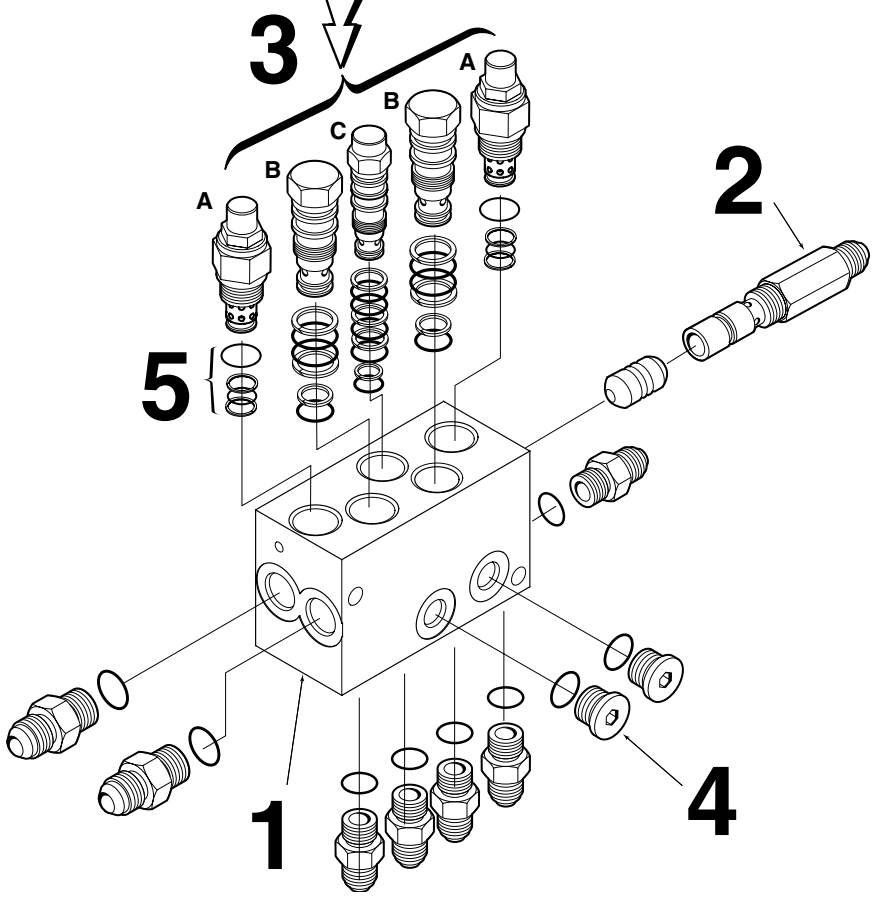
5.3-2 Check Valve Service (With Regeneration 2500/3200 kg Clamps)

IMPORTANT: Service the Check Valve in a clean work area.

1. Remove the valve from the clamp.
2. Remove the special fitting.
3. Remove the cartridges from the valve body.
4. Remove the remaining plugs and fittings.
5. Remove the O-rings and back-up rings from the cartridges.
6. Clean all parts with kerosene or cleaning solvent.
7. For reassembly, reverse the above procedures except as follows:

- The cartridge valve back-up rings and O-rings must be installed as shown to avoid seal damage during reassembly.
- Lubricate cartridges and seals with petroleum jelly prior to reassembly.





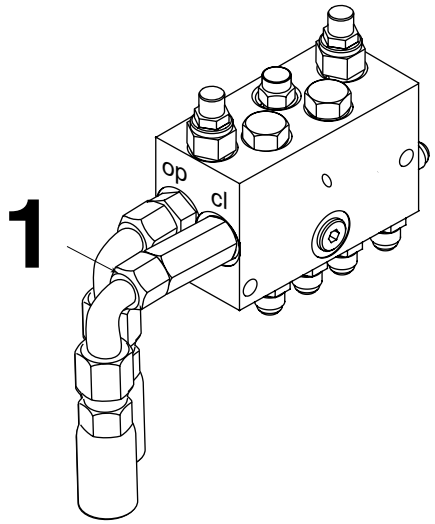
5.3-3 Removing Regeneration

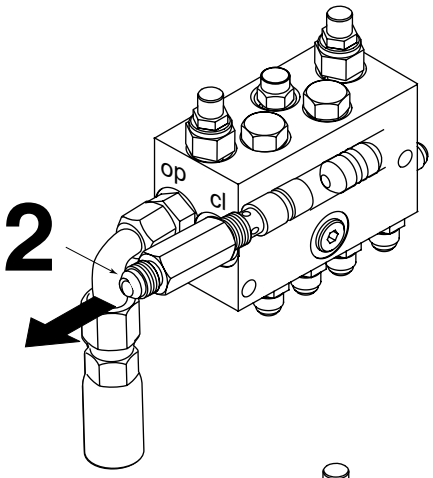
Before removing any hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

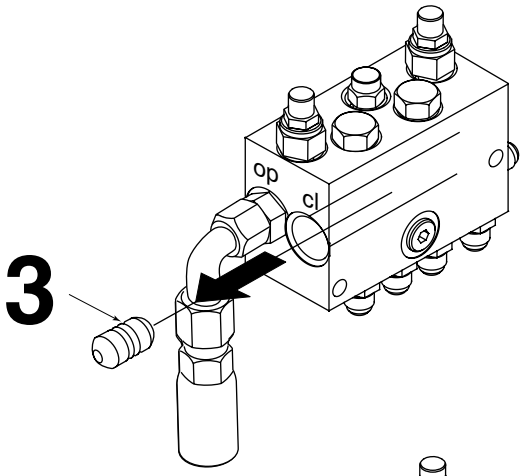
IMPORTANT: Service the Valve in a clean work area This process can be done with the valve on the clamp.

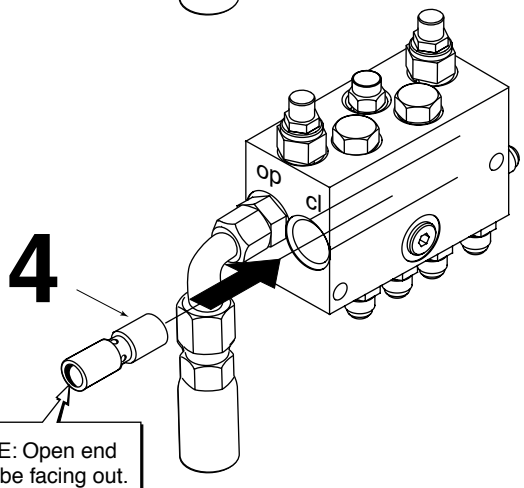
1. Remove hose from clamp close (cl) fitting
2. Remove special long fitting from valve .
3. Remove the spool fitting. It may be necessary to power the 'open' (op) line to force out spool
4. Insert 'Blanking Fitting' into valve body - Note : open end must face out.
5. Replace special long fittings. Reconnect hose line.

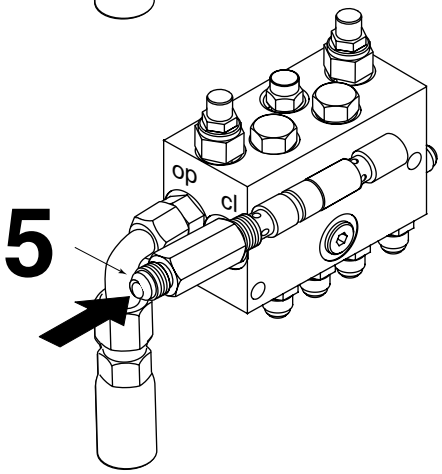
- Open /Close times can be increased by up to 2-3 seconds when regeneration is removed.











5.4 Cylinders

5.4-1 Cylinder Service

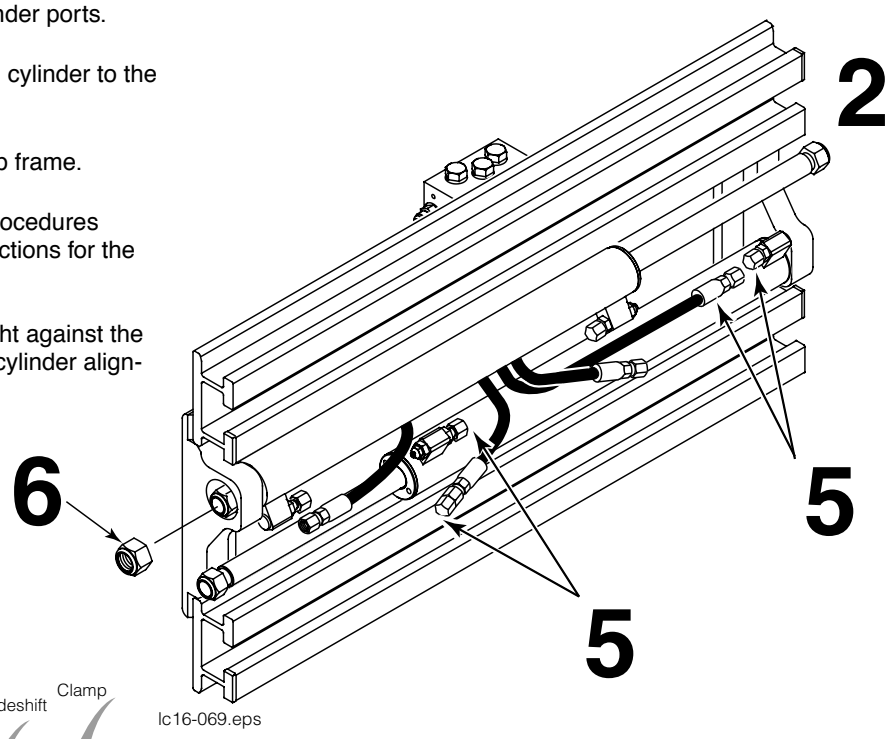
The following procedures can be performed with the attachment mounted on the truck.

> Before removing any hydraulic lines, relieve pressure in the hydraulic system. Turn the truck off, then open the truck auxiliary control valves several times in both directions.

5.4-2 Cylinder Removal

1. Extend or remove the arms outside the width of the frame.
2. Remove the nylock nuts retaining the cylinder rods to the arm lugs.
3. Retract the cylinder rods until they come out of engagement with the arm lugs.
4. Relieve hydraulic system pressure - actuate all auxillary levers several times to relieve pressure in the lines - this is not necessary on hoist lever .
5. Disconnect the hyraulic lines from the cylinder ports. Plug the lines and cap the cylinder ports.
6. Remove the nylock nuts retaining the cylinder to the frame lugs.
7. Lift the cylinders away from the clamp frame.
8. For reassembly. reverse the above procedures except for the following special instructions for the cylinder anchor nuts.

NOTE: The rod end nut MUST not be tight against the arm base lug. This looseness allows for cylinder alignment during clamping.



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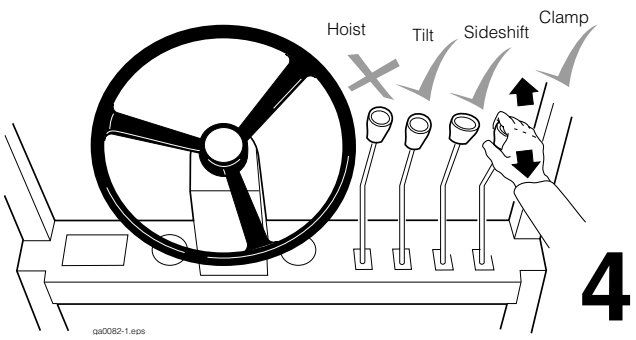

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5.4-3 Cylinder Dismantle and Reassembly

1 Clamp cylinder in a soft-jawed vise. Clamp at the extreme base end only.

2 Remove the retainer by using a pin type spanner wrench. DO NOT use a punch as this may cause damage to the retainer nut.

3 Remove the rod assembly from the cylinder.

4 Clamp the rod assembly on the wrench flats. Never clamp directly on the rod sealing surface.

5 Remove the nut fastening the piston to the rod. Remove the piston

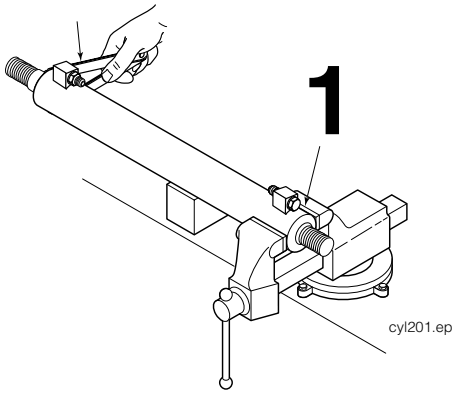
6 Place the piston or gland nut in a soft-jawed vise to remove the seals. Pry the seals up with a blunt screwdriver. Cut the seal to remove them.

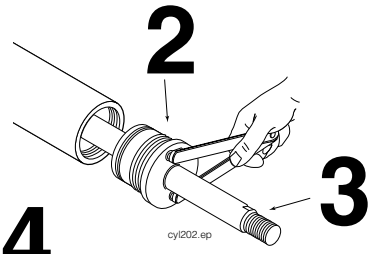
7 Replace all the seals in order as shown - NOTE direction of seals in housing.

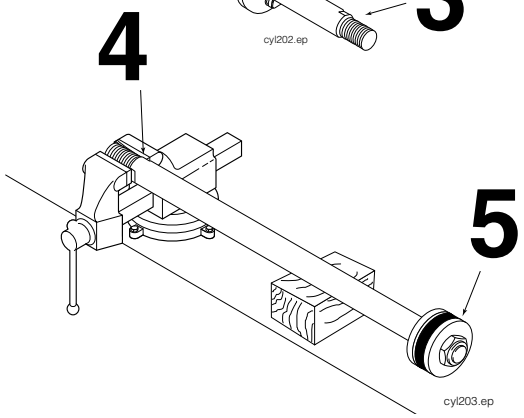
8 For installation, reverse the above proceedure except for the following special instructions.

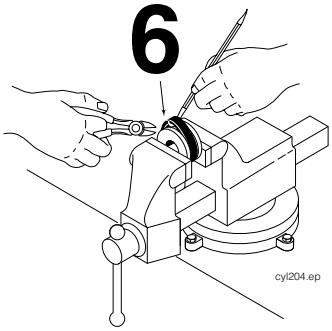
- Lubricate all seals and 'O' rings with petroleum jelly or STP.
- When installing the cylinder rod nut, tighten to 90 ft/lbs (125 Nm)
- When installing the cylinder gland nut, tighten to 75 ft/lbs (100 Nm)

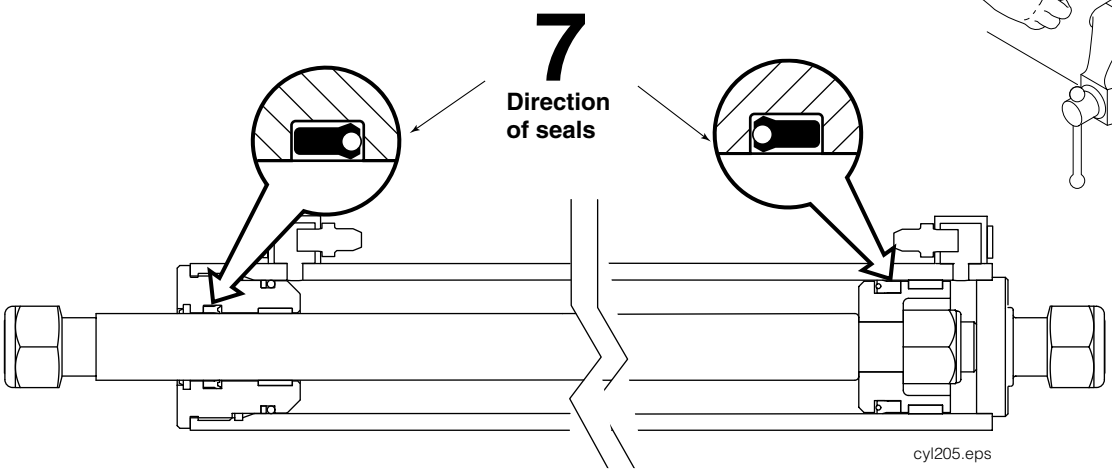
CAUTION: Do not scratch the seal grooves.











6.1 Specifications

6.1-1 Hydraulics

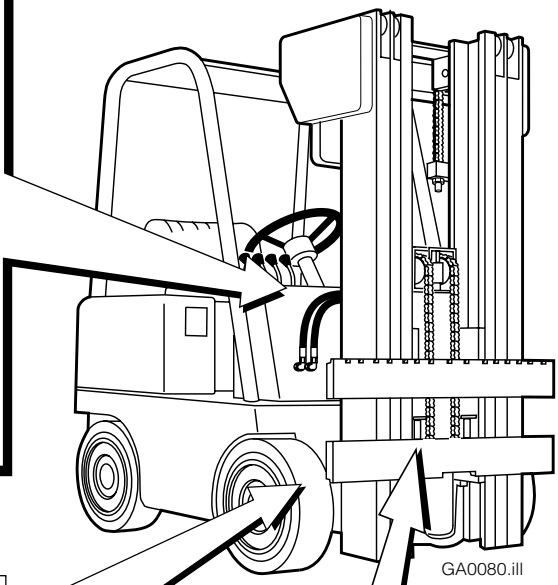
Truck Relief Valve Setting:
2300 psi (160 bar), maximum.
2000 psi (140 bar), recommended.

Truck Flow Volume ①

Capacity	Min ②	Recommended	Max ③
3200 Lbs (1600 Kg)	**5.2 GPM** (19 L/min)	**10 GPM** (28 L/min)	**13 GPM** (49 L/min)
5500 Lbs (2500 Kg)	**5.2 GPM** (19 L/min)	**10 GPM** (28 L/min)	**13 GPM** (49 L/min)
7000 Lbs (3200 Kg)	**7.8 GPM** (29 L/min)	**14 GPM** (52 L/min)	**17 GPM** (63 L/min)

① Hydraulic Oil - Cascade attachments are compatible with SAE 10W petroleum base oil per Mil. Spec. Mil-0-5606 or MIL-0-2104B.
Use of synthetic or aqueous base hydraulic oil is not recommended.
Contact cascade if fire resistant hydraulic oil must be used.
② Flow less than minimum will result in equal arm movement
③ Low greater than maximum can result in excessive heating, reduce systen performance and short hydraulic system life.

box01



6.1-2 Truck Carriage

Carriage Mount Dimension (A) ITA (ISO)

	Minimum	Maximum
Class II	14.96 in (380.0mm)	15.00 in (381.0 mm)
Class III	18.68 in (474.5mm)	18.74 in (476.0 mm)
Class IV	14.96 in (595.5mm)	23.50 in (597.0 mm)

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HOSES AND FITTINGS
All supply hoses must be at least No 6 minimum. Recommended No 9.
All fittings must have an orifice size of 9/32 in (7 mm) minimum.

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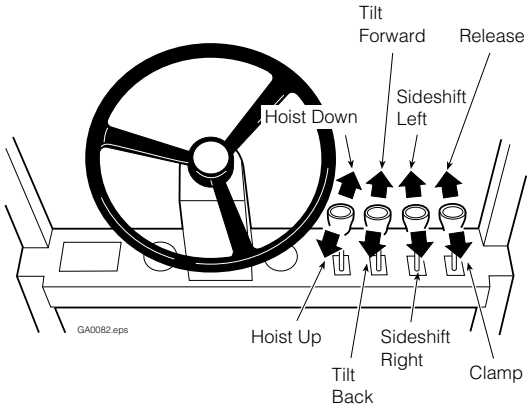
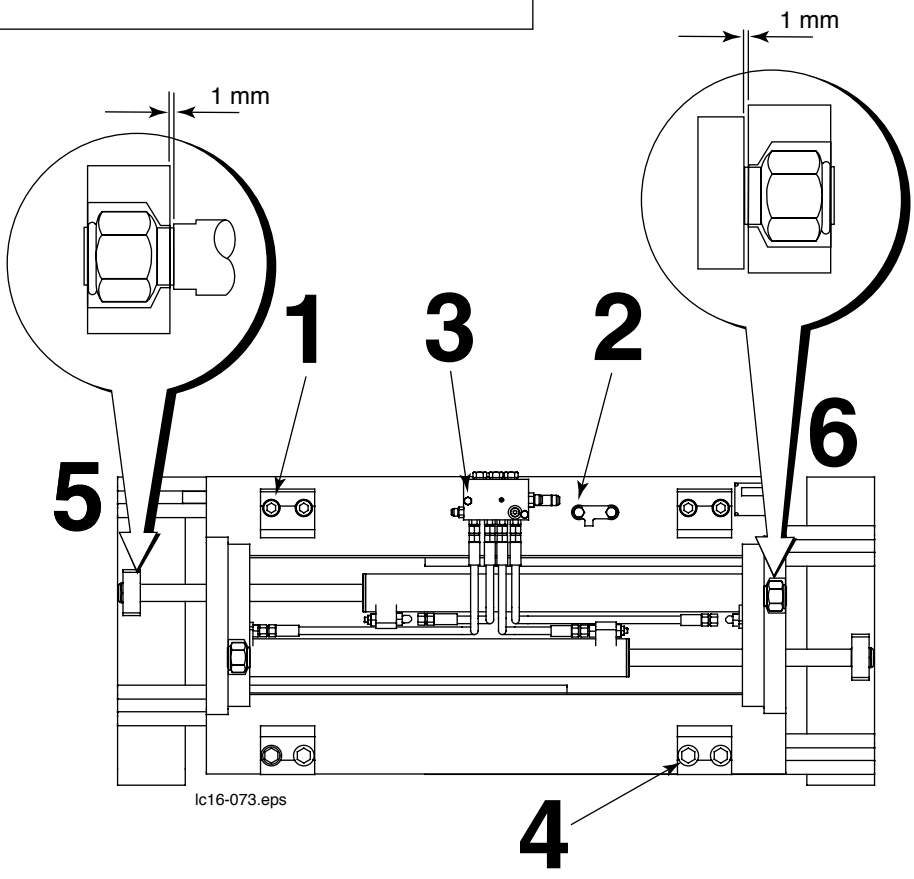
6.1-3 Auxilliary Valve Functions



6.1-4 Torque Values

Fastener torque values for the Series 4 Clamps are shown in the table below in both U.S. and Metric units. All torque values are also called out in each specific service procedure section throughout the Manual

REF	Description	Size	ft.lbs	Nm
1	Top mounting Hook	M-16 M-20	242 477	330 ● 650 ●
2	Centering Bar	M-12	75	100 ●
3	Valve Mounting Bolts	M-8	15	20
4	Lower mounting Bolts	M-16 M-20	195 235	285 ● 320 ●
5	Cylinder Nuts - Rod - Tighten then loosen 1/4 turn			
6	Clinder Nuts - Base - Tighten then loosen 1/4 turn			
●	Use Locktite 242 (blue)			



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AMERICAS

Cascade Corporation
U.S. Headquarters
2201 NE 201st
Fairview, OR 97024-9718
Tel: 800-CASCADE (227-2233)
Fax: 888-329-8207

Cascade Canada Inc.
5570 Timberlea Blvd.
Mississauga, Ontario
Canada L4W-4M6
Tel: 905-629-7777
Fax: 905-629-7785

Cascade do Brasil
Rua João Guerra, 134
Macuco, Santos - SP
Brasil 11015-130
Tel: 55-13-2105-8800
Fax: 55-13-2105-8899

EUROPE-AFRICA

Cascade Italia S.R.L.
European Headquarters
Via Dell'Artigianato 1
37050 Vago di Lavagno (VR)
Italy
Tel: 39-045-8989111
Fax: 39-045-8989160

Cascade (Africa) Pty. Ltd.
PO Box 625, Isando 1600
60A Steel Road
Sparton, Kempton Park
South Africa
Tel: 27-11-975-9240
Fax: 27-11-394-1147

ASIA-PACIFIC

Cascade Japan Ltd.
2-23, 2-Chome,
Kukuchi Nishimachi
Amagasaki, Hyogo
Japan, 661-0978
Tel: 81-6-6420-9771
Fax: 81-6-6420-9777

Cascade Korea
121B 9L Namdong Ind.
Complex, 691-8 Gojan-Dong
Namdong-Ku
Inchon, Korea
Tel: +82-32-821-2051
Fax: +82-32-821-2055

Cascade-Xiamen
No. 668 Yangguang Rd.
Xinyang Industrial Zone
Haicang, Xiamen City
Fujian Province
P.R. China 361026
Tel: 86-592-651-2500
Fax: 86-592-651-2571

Cascade India Material Handling Private Limited
No 34, Global Trade Centre
1/1 Rambaugh Colony
Lal Bahadur Shastri Road,
Navi Peth, Pune 411 030
(Maharashtra) India
Phone: +91 020 2432 5490
Fax: +91 020 2433 0881

Cascade Australia Pty. Ltd.
1445 Ipswich Road
Rocklea, QLD 4107
Australia
Tel: 1-800-227-223
Fax: +61 7 3373-7333

Cascade New Zealand
15 Ra Ora Drive
East Tamaki, Auckland
New Zealand
Tel: +64-9-273-9136
Fax: +64-9-273-9137

Sunstream Industries Pte. Ltd.
18 Tuas South Street 5
Singapore 637796
Tel: +65-6795-7555
Fax: +65-6863-1368

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